JUL 10 1924

Subscription Price:
United States and Canada, $6.00 Per Year.

Great Britain, 25 Shillings; Single Copies, 2 Shillings.
Foreign, $6.00 Per Year; Single Copies, 75 Cents.

VOLUME VI JULY, 1924 NUMBER 3

THE JOURNAL OF INDUSTRIAL HYGIENE

AND ABSTRACT OF THE LITERATURE

OFFICIAL ORGAN OF
THE AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS

EDITOR, UNITED STATES
DAVID L. EDSALL, M.D., S.D.

HONORARY CONSULTING EDITOR
THOMAS M. LEGGE, M.D., D.P.H.

EDITOR, GREAT BRITAIN
E. L. COLLIS, M.D., M.R.C.S.

A Five Years' Sickness and Accident Experience in the Edison Electric Illuminating Company of Boston

Carbon Monoxide Hazard in Public Garages

Health Supervision of Employees in Financial Organizations

Mental Hygiene in Industry

PUBLISHED MONTHLY BY HARVARD MEDICAL SCHOOL

EDITORIAL AND BUSINESS OFFICES : : 55 VAN DYKE STREET, BOSTON 17, MASSACHUSETTS
GREAT BRITAIN : : INDUSTRIAL WELFARE SOCIETY, 51 PALACE STREET, WESTMINSTER, S. W. 1

Entered as second-class matter, at the Post Office at Boston, Mass., under Act of March 3, 1879. Published Monthly.
Copyright, 1924, by Harvard Medical School.

IMPORTANT NEW BOOKS

Insanity and Law

This book states in simple language psychiatric facts regarded as established, using a nomenclature that has been adopted as a standard by almost all the hospitals for mental diseases in this country.

The section dealing with the legal aspects of mental disorder traces the origin and meaning of the various procedures and illustrates the meaning by quotations of decisions by various courts. The references have been selected on the basis of practical experience in dealing with medico-legal problems.

By H. Douglas Singer, M.D., M.R.C.P., Professor of Psychiatry, University of Illinois, and William O. Krohn, M.D., Ph.D., Formerly Head of Department of Psychiatry at Western Reserve University and at University of Illinois, etc.

Imitation Leather, $6.00

Industrial Health

An Indispensable New Reference Work on Industrial Hygiene, Public Health, Safety Appliances, Maintaining Health in Industry; Cause and Preventive Measures; Standards; Welfare Measures; Federal, State, Local Health Agencies; Industrial Nurse; Vocational Hygiene of Certain Industries; Occupational Intoxications; Occupational Infectious Diseases, Dust, Fatigue, Abnormal Atmospheric Pressure, Electrical Injuries, etc.; Systemic Occupational Diseases; Statistics, Use and Fallacies of; Protective Legislation; Child Labor; Women; Employes' Compensation; Charts for Analyzing Health Complaints, Personal Health Data, Guide to Diagnostic Signs of Lead Poisoning, Addenda.

Prepared by Collaboration of 33 Authors. Edited by George M. Kober, M.D., LL.D., Washington, D. C., and Emery R. Hayhurst, A.M., M.D., Ph.D., Columbus, Ohio. With Illustrations, Tables, Appendix.

Cloth, $15.00

Public Health Administration

Relation of Health Officer to Physician and Public; Organization, Function, Health Departments; Finance, Management; Births, Deaths, Heredity, Vital Statistics, Maternal Mortality, Infant Mortality, Hygiene; Child Hygiene; Water, Sewage Wastes, Milk, Foods, Education, Publicity, Laws, Social Welfare, State and Federal Departments; Preventable Diseases; Appendices; Nurse; Score Cards; Plans; Emergencies; Technique; Bibliography, etc.

By George Sparr Luckett, A.B., M.D., Director of Public Health, State of New Mexico, and Harold Farnsworth Gray, B.S., M.S., Gr.P.H., Chief, Division of Sanitary Engineering and Sanitation, New Mexico Bureau of Public Health.

Cloth, $3.00

P. Blakiston's Son & Co., *Publishers*

1012 Walnut Street, Philadelphia

THE JOURNAL OF INDUSTRIAL HYGIENE

PUBLISHED MONTHLY

VOLUME VI JULY, 1924 NUMBER 3

A FIVE YEARS' SICKNESS AND ACCIDENT EXPERIENCE IN THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON*

CLARENCE OLDS SAPPINGTON, A.B., M.D.

From the Departments of Industrial Medicine and Vital Statistics, Harvard School of Public Health

I. HISTORICAL SKETCH

IN 1913 the Edison Electric Illuminating Company of Boston began to collect and to keep very careful medical records of its employees. Practically all cases of absenteeism due to either sickness or accident were seen by a physician within thirty-six hours after the onset of the trouble. The records were so tabulated as to give information regarding age, sex, birthplace, nationality, occupation, department, social status, duration of service, onset of difficulty by year, month and day of week, number of calendar and working days lost, diagnosis, cause of accident, wage grouping, benefits paid, and person making the diagnosis.

With this body of data as a basis for study, Dr. Wade Wright, of the Industrial Clinic of the Massachusetts General Hospital, and Mr. H. W. Moses, Employment Superintendent of the Edison Company, had several conferences, with the result that a punch card form was originated so that the data could be properly recorded and studied. The work of punching the cards was begun by the company during the summer of 1921; by October, 1923, the records for the years 1922, 1921, and 1920 had been transferred and the present study was begun. In December, 1923, the work of punching out the records for the five-year period 1918 to 1922 was completed.

II. THE SOURCE OF THE STATISTICAL MATERIAL

The Edison Company had an average of approximately 2,233 employees during the period 1918 to 1922, with an average annual turnover of 20 per cent. These people ranged from 17 to 72

*This article embraces a portion of the material presented as a dissertation for the Doctorate in Public Health, Harvard School of Public Health, May 1, 1924. The Edison Electric Illuminating Company of Boston, whose co-operation has made possible the accomplishment of this work, has arranged to publish and distribute the study as a whole. A nominal charge will be made to cover the cost of publication. Requests for copies should be sent to the Edison Electric Illuminating Company, 39 Boylston Street, Boston, Mass.

Received for publication May 5, 1924.

years of age, the proportion of females to males being about 1 to 4.5. About 90 per cent. were American born. The majority of the women were single and the greater number of the men were married.

The departments, thirty-six in number, represented a wide variety of working conditions and the eighty-four occupations, likewise, a considerable latitude with regard to the kind of work done. A perusal of the following list of departments and occupations will make this statement clearer.

Departments

1. Accounting
2. Advertising
3. Appliance
4. Auditing
5. Billing
6. Bookkeeping
7. Cashier's
8. Collection
9. Compiled Statistics
10. Customers' Adjustment
11. Electrical Engineering
12. Employees' Buildings
13. Employment
14. Executive
15. Field Statistics
16. Generating
17. General Service
18. General Superintendent's
19. Information
20. Installations
21. Maintenance of Lines
22. Medical
23. Operating Bureau Accounts
24. Purchasing
25. Real Estate
26. Sales
27. Service Buildings
28. Special Service
29. Special Research
30. Standardizing and Testing
31. Station Engineering
32. Steam Heating Service
33. Street Engineering
34. Suburban District Managers
35. Supply
36. Transportation

Occupations

1. Accountant
2. Batteryman
3. Buyer
4. Cableman
5. Car Dispatcher
6. Cashier
7. Catchboxman
8. Chauffeur
9. Chief Tester
10. Cleaner
11. Clerk
12. Coal Passer
13. Collector
14. Demand Tester
15. Dictaphone Operator
16. District Manager
17. Division Head
18. Draftsman
19. Driver (Express)
20. Elevator Operator
21. Engineer
22. Engineer (Boiler Room)
23. Engineering (Watch)
24. Fireman
25. Floorman
26. Foreman and Assistants
27. Gardener
28. Gateman
29. Groundman
30. Inspectors
31. Installer
32. Janitor
33. Kitchen Help
34. Laborer
35. Lamp Deliveryman
36. Lead Burner
37. Librarian
38. Lineman—1st Class
39. Lineman—2d Class
40. Lineman—3d Class
41. Load Dispatcher and Assistants
42. Lumper
43. Matron
44. Messenger
45. Metal Cleaner
46. Meter Indexer
47. Meter Tester
48. Night Watchman
49. Nurse
50. Office Boy
51. Oiler
52. Oilman
53. Operator
54. Photographer
55. Receiving Teller
56. Repairman
57. Repairman (Auto)
58. Repairman (Electric)
59. Repairman (Boiler and Steam)
60. Restaurant Help
61. Right of Way Agent
62. Salesman
63. Secretary
64. Scrubwoman
65. Solderer
66. Splicer
67. Stenographer
68. Steward
69. Stock Handler
70. Switchboardman
71. Switchman
72. Telephone Operator
73. Testman
74. Tracer
75. Trimmer-Patrolman
76. Troubleman
77. Tube Blower
78. Typist-Copyist
79. Washer
80. Watertender
81. Winder
82. Window Dresser
83. Yardman
84. Pin Boy

The work in this company presented no more than the usual hazards found in similar organizations supplying electric current for commercial use. The hazards are generally considered to be as follows:

A. Accident hazards
   1. Electric current
   2. Slipping, tripping, and falling on levels, poles, or structures
B. Health hazards[1]
   1. Exposure to respiratory disease
   2. Exposure to digestive disorders

Since February, 1913, each employee upon entering the service of the company has received a physical examination. Rejections are made of those having serious defects of the heart, lungs or kidneys, and of those having hernias likely to cause trouble. No periodic examinations are made.

Each worker is credited with one working day of sick allowance (with full pay) for each month during the first year of his employment. After being with the company for one year, he is allowed twelve working days sick leave (with full pay) at any time during any calendar year. If an employee who

[1]The health hazards given are not strictly chargeable to the industry but are mentioned because they are considered to be among the chief causes of lost time.

J. I. H.
July, 1924

has used up his allowance of twelve working days becomes ill, he must wait seven days before he may again draw full pay. Up to the fifteenth calendar day of disability, the department in which the absentee works pays the salary; on the fifteenth day the account is transferred to the benefit fund and full salary is paid from this fund for fifteen weeks (counting the time already elapsed). This applies to all persons, including those who have been subject to a seven-day waiting period. Most cases fall into the latter group—*i.e.*, a full salary basis on absenteeism for fifteen weeks or under. No employee may draw compensation for an accident and for some form of sickness at the same time.

III. Procedure

The card used by the Edison Company for purposes of tabulation is the so-called "dual" type of punch card (see Fig. 1). It differs from the ordinary style in that the data may be both punched and written. This arrangement is useful in various ways, particularly when rapid reading is necessary or when one wishes to check up the various small segregations or to correct errors which have been made in the punching.

Numerical items were merely punched on the cards in the proper column; other items were given a code number. The code used is shown under Figure 1. In registering the diagnosis in each case of absenteeism, the International List of the Causes of Sickness and Death was employed.

Because of the fact that the data recorded by the Edison Company were based upon absenteeism resulting from various minor maladies which caused short periods of absenteeism; also because the company, as has already been mentioned, had made provisions for the payment of the full salary up to the fifteenth week of absenteeism due to sickness; and, finally, because the majority of the cases were seen and diagnosed by a physician within thirty-six hours after the onset of the trouble, it was believed that an unusual opportunity presented itself for a study of morbidity incidence, which would be rather difficult, if not impossible, under less favorable circumstances.

Accordingly, the following outline was developed and used in attempting to evaluate the factors concerned in the causation of disease and accidents:

I. Disease
  - A. Twelve greatest frequencies
  - B. The six highest segregated as to
    1. Lost time
    2. Occupation
    3. Department
    4. Age and sex
    5. Benefits paid
    6. Day of onset
    7. Seasonal incidence

II. Time Lost
  - A. Greatest frequencies one to six day groups and over ten day group, based on working days lost
  - B. The one to six day and over ten day groups of absenteeism, segregated as to
    1. Occupation
    2. Department
    3. Age and sex
    4. Wage grouping
    5. Benefits paid

III. Accidents
  - A. Greatest frequencies by cause
  - B. Time lost
  - C. Occupation
  - D. Department
  - E. Age and sex
  - F. Benefits paid
  - G. Day of onset
  - H. Seasonal incidence

IV. Home Accidents
  - A. Time lost
  - B. Age and sex
  - C. Day of onset
  - D. Seasonal incidence
  - E. Benefits paid

V. Miscellaneous Factors
A. Duration of service
B. Social status

In accordance with this guide the cards for each year (as they were supplied grouped by years) were run through a Powers sorting machine. By the use of this machine the cards were counted at the same time that they were sorted. Where there was only one column on the card it was necessary to sort only once. Under items where there was more than one vertical column, it was necessary to make several segregations.

As an example of how these groupings were accomplished, let us consider the study of common colds. In a preliminary sorting of the various diseases (using columns 29, 30, and 31) it was discovered that common colds, or 97, were the chief cause of absenteeism. All cards with the diagnosis 97 were sorted out and reserved for future segregation. According to the outline, the next step was to find out how much loss of time was caused by common colds. This was done by making use of columns 26, 27, and 28, by which it was possible to determine in how many cases there was a loss of one day, two days, etc., and to compute the total days lost and the average days lost per case. What occupations furnished the greatest num-

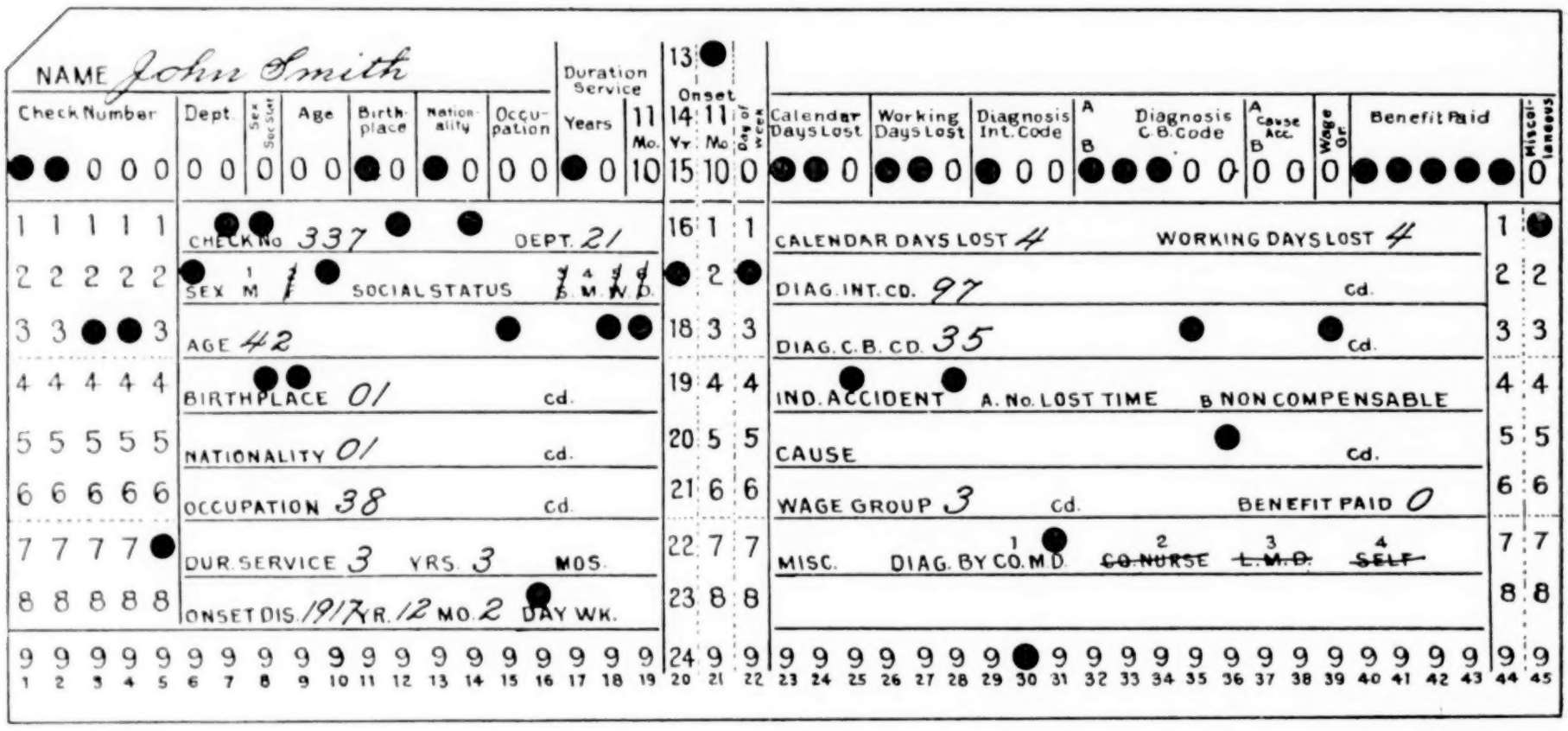


FIGURE 1.—Card form used in this study.

CODE USED ON CARDS[1]

1. Nationality and Birthplace

01. United States
11. Central and South America
20. Canada (excluding Quebec, Fr. Can.)
21. England
22. Ireland
23. Scotland
24. British Empire (n. o. s.)
30. France (including Quebec, Fr. Can.)
31. Belgium
32. Spain
33. Portugal
34. Italy
35. Switzerland
40. Austria (excluding Austrian Poland)
41. Hungary
42. Germany (excluding German Poland)
43. Holland
44. Norway
45. Sweden
46. Denmark
47. Finland
50. Russia (excluding Russian Poland)
51. Hebrew
52. Poland
53. Lithuania
54. Russia (n. o. s.)
60. Greece
61. Serbia (including Albania and Montenegro)
62. Roumania
63. Turkey
64. Armenia
65. Syria
70. China
71. Japan
80. Foreign countries (n. o. s.)

[1]The numbers assigned to the departments and occupations are given under "The Source of the Statistical Material" and consequently are not repeated here.

J. I. H.
July, 1924

2. Causes of Accidents[2]

1. Burns—acid, compound, solder, gasoline, iron, powder, gas, torch, rope, furnace door, soot, etc.
2. Burns—hot water, steam, rouse bar, cinders, oil, cylinder, etc.
3. Burns—short circuits, flashes, electric shock, etc.
4. Cuts—glass.
5. Cuts—knives, saws, wires, nails, splinters, pencils, material, etc.
6. Explosion, exposure, overcome by gas or heat, sickness, pain, fright, fallen arches, frost-bite, etc.
7. Failure of metal.
8. Falls—off ladders, poles, trees, teams, chairs, etc.
9. Falls—on level, over material, into excavations or openings, due to slipping.
10. Falls—on stairs.
11. Handling ashes, coal, wood, rouse bar, etc.
12. Handling stock or machinery, soap powder, arc lamps, material.
13. Handling tools.
14. Injured by animals, insect bites, altercation.
15. Manhole covers.
16. Material in eye, eyestrain.
17. Operating machinery.
18. Sprained, strained, jammed, pinched, dislocated, bruised, bumped, numbness, crushed, blister, fracture, infection, wrenched, scratched, collision, abrasion, swollen, nail ripped off, wart knocked off.
19. Stepping on nails, nail punctures, spur, stones, stumbling, pierced by nail, etc.
20. Struck by falling bodies, stones, ice, wood, materials, tools.
21. Struck by vehicles, collision, skidding, steering gear broke, cranking car, changing tires, repairing cars, etc.
22. Struck by material, tools, door, etc.

3. Wage Grouping

1.	$1.00 — $10.00	5.	$40.01 — $50.00
2.	$10.01 — $20.00	6.	$50.01 — $60.00
3.	$20.01 — $30.00	7.	$60.01 — $70.00
4.	$30.01 — $40.00	8.	$70.01 — $100.00

[2]It is realized that this accident code is inadequate; the records were based upon it, however, and the cards had been punched accordingly.

ber of cases of common colds? This was found out by sorting in columns 15 and 16. The process of sorting was kept up until all the various factors which the outline shows had been taken into account; crude tabulations were then made, in which the figures were arranged in the order of their highest frequency.

The company furnished tables showing the population grouped according to the average number of persons of each sex; in the age groups 10-19, 20-29, 30-39, 40-49, 50-59, 60 and over; in each department; in each occupation; in each wage group; and the average total population by months during the five-year period 1918 to 1922, inclusive. From these figures it was possible to compute rates per hundred persons, per hundred men, and per hundred women, for use in comparing the various factors causing absenteeism.

During three or four preliminary runs of the record cards several pertinent facts were disclosed:

1. Approximately 97 per cent. of the cases of absenteeism were among the American-born. Since the same code had been used for the birthplace and the nationality, and since only 3 per cent. was divided among all the rest of the nationalities, it was not deemed wise to separate and analyze the small group of foreign-born absentees. Further segregations of this small group would have given figures too small to be of any real significance.

2. The greater number of employees were either single or married; any cognizance of the social status should be taken on the basis of this division. It was further discovered that the majority of the women were single and the majority of the men were married.

3. The number of working days lost differed from the number of calendar days lost only by Sundays and holidays.

From the standpoint of the economic loss to the industry, it was thought expedient to use working days lost as the basis of computing time lost on account of disease or accidents.

4. The International List of the Causes of Sickness and Death was used in compiling diagnosis because of its general adoption in Paris in 1920; because some work has already been done using this code; and because the Census Bureau Code was found to be too detailed and lengthy.

5. In approximately 98 per cent. of the cases of absenteeism in this study, the recorded diagnosis was made by a physician.

IV. Important Findings

Disease.—In practically all absenteeism studies it has been a very difficult matter to obtain reliable data based on sickness experience. In the Edison survey, therefore, especial emphasis has been placed on the occurrence of disease.

Of the six principal diseases that were studied in detail (see Table 1 and Figure 2), common colds easily occupied first place with 5,328 cases, causing 34.3 per cent. of all absenteeism, and showing a rate of 47 per hundred employees and an average loss of 3.2 days per case per year. Dysmenorrhea was second

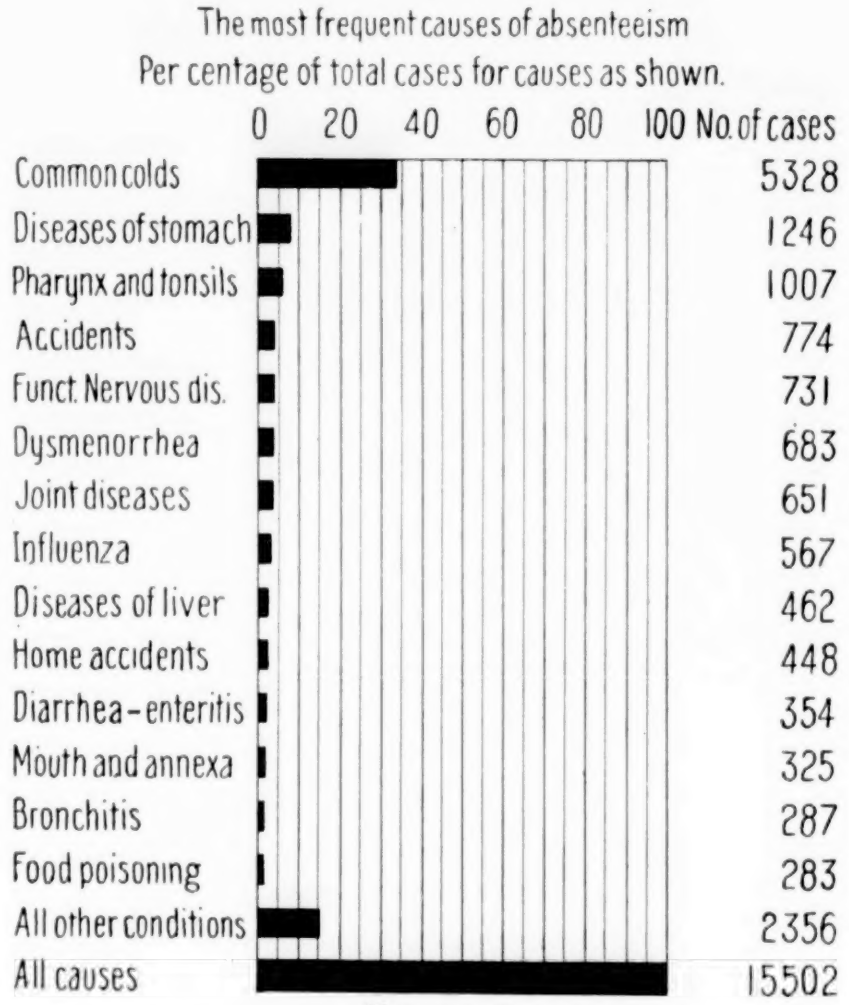


FIGURE 2

from the standpoint of rates, with a figure of 32 per hundred women. Diseases of the stomach, while second in number of cases (1,246), showed a rate of only 11 per hundred employees. Pharyngitis and tonsillitis, functional nervous diseases, and rheumatism, arthritis and gout completed the group with rates of 9, 6, and 6 per hundred employees, respectively.

In considering severity, it was found that functional nervous diseases stood at the head of the list, with an average loss of 9.4 days per case. Next in order came rheumatism, arthritis and gout, showing a case average of 7.4 working

TABLE 1.—NUMBER OF CASES, TOTAL RATES, AND WORKING DAYS LOST FOR THE SIX HIGHEST DISEASES CAUSING ABSENTEEISM DURING 1918 TO 1922

Disease	Number of Cases	Rate per 100 Employees	Total Working Days Lost	Average Working Days Lost per Case
Common colds	5,328	47	16,983	3.2
Dysmenorrhea	683	32 (per 100 women)	1,486	2.1
Diseases of stomach	1,246	11	2,647	2.1
Pharyngitis and tonsillitis	1,007	9	4,698	4.9
Functional nervous diseases	731	6	6,882	9.4
Rheumatism, arthritis, and gout	651	6	4,781	7.4
All diseases	14,280	128	83,280	5.8

days lost. That both of these maladies ordinarily disable a patient for a considerable length of time is a well-known clinical fact. It is an interesting observation that those affections which made up the bulk of the number of cases of absenteeism were lowest in their severity rates (common colds, dysmenorrhea, and diseases of the stomach), but in the aggregate the loss of time chargeable to them was indeed significant.

Rates for the principal diseases by age groups persistently showed a phenomenon contrary to that usually observed. There was a progressive decrease in rates as age increased (see Table 2). This was true except in the case of joint affections; it is generally known, of course, that such troubles occur with greater frequency in the later years of life.

Women showed higher rates than men in all diseases studied in detail except diseases of the stomach and rheumatism, arthritis, and gout (see Table 3). The latter dissociation may be explained by the fact that the women were found mainly in the younger age groups; as to the former, it has been suggested that women eat less in amount and perhaps lighter foods than men.

Table 4 shows by age groups the number of cases of disease absenteeism for one, two, three, four, five, six, and over ten day periods and the rates per hundred employees for each group. A consistent decrease was observed in the total number of cases in each period as severity increased. The 10-19 age group showed throughout a higher rate than the average except in the over ten day absences, where the 60 group led—the only instance of this phenomenon in the series. A possible explanation of the high rates for young persons is that the young employees do not live as regular lives as the older people.

TABLE 2.—RATES PER HUNDRED EMPLOYEES, BY AGE GROUPS, FOR THE SIX HIGHEST DISEASES CAUSING ABSENTEEISM DURING 1918 TO 1922

Disease	Rates per 100 Employees in Age Groups						
	10-19	20-29	30-39	40-49	50-59	60+	All Ages
Common colds	101	57	50	51	31	18	47
Diseases of stomach	23	15	11	10	6	3	11
Pharyngitis and tonsillitis	21	13	9	5	2	1	9
Functional nervous diseases	13	9	6	5	4	2	6
Dysmenorrhea (rates per 100 women)	30	42	20	12	4	0	32
Rheumatism, arthritis, and gout	2	4	6	10	10	8	6
All other diseases	110	47	45	45	33	30	41
All diseases	285	158	132	128	88	61	128

TABLE 3.—NUMBER OF CASES, TOTAL RATES, AND SEX RATES PER HUNDRED EMPLOYEES FOR THE SIX HIGHEST DISEASES CAUSING ABSENTEEISM DURING 1918 TO 1922

Disease	Number of Cases	Rate per 100 Employees	Rate per 100 Men	Rate per 100 Women
Common colds	5,328	47	41	76
Diseases of stomach	1,246	11	17	9
Pharyngitis and tonsillitis	1,007	9	6	19
Rheumatism, arthritis, and gout	651	6	6	4
Dysmenorrhea	683	——	——	32
Functional nervous diseases	731	6	3	19
All other diseases	4,645	41	51	222
All diseases	14,280	128	157	683

TABLE 4.—DISEASE ABSENTEEISM (ACCORDING TO DURATION) BY AGE GROUPS DURING 1918 TO 1922

Age Group	Number of Cases	Rate per 100 in Age Group
One Day		
10–19	574	132
20–29	2,922	71
30–39	1,433	48
40–49	575	38
50–59	183	24
60+	38	12
All ages	5,725	51
Two Days		
10–19	194	44
20–29	1,293	31
30–39	764	25
40–49	388	25
50–59	130	17
60+	23	7
All ages	2,792	25
Three Days		
10–19	101	23
20–29	628	15
30–39	478	16
40–49	257	16
50–59	77	10
60+	27	9
All ages	1,568	14
Four Days		
10–19	60	13
20–29	331	8
30–39	283	9
40–49	141	9
50–59	47	6
60+	10	3
All ages	875	8
Five Days		
10–19	36	8
20–29	283	7
30–39	175	5
40–49	101	6
50–59	44	6
60+	9	3
All ages	648	6
Six Days		
10–19	41	9
20–29	254	6
30–39	156	5
40–49	108	7
50–59	30	4
60+	8	2
All ages	597	5
Over Ten Days		
10–19	70	16
20–29	452	11
30–39	335	11
40–49	241	15
50–59	99	13
60+	59	19
All ages	1,256	11

In all absenteeism groupings the disease rates for female workers were higher than those for men and also than those noted per hundred employees (see Table 5). This observation agrees with the usually accepted belief that, generally speaking, women are poorer hygienic risks in industry than men.

Seasonal variations of disease incidence have often afforded interesting material for study. In this study the rates for all diseases showed a gentle downward swing in the spring to a summer minimum and a corresponding autumnal increase to a winter maximum (see Fig. 3). Common colds exhibited widely fluctuant rates. Dysmenorrhea and functional nervous diseases

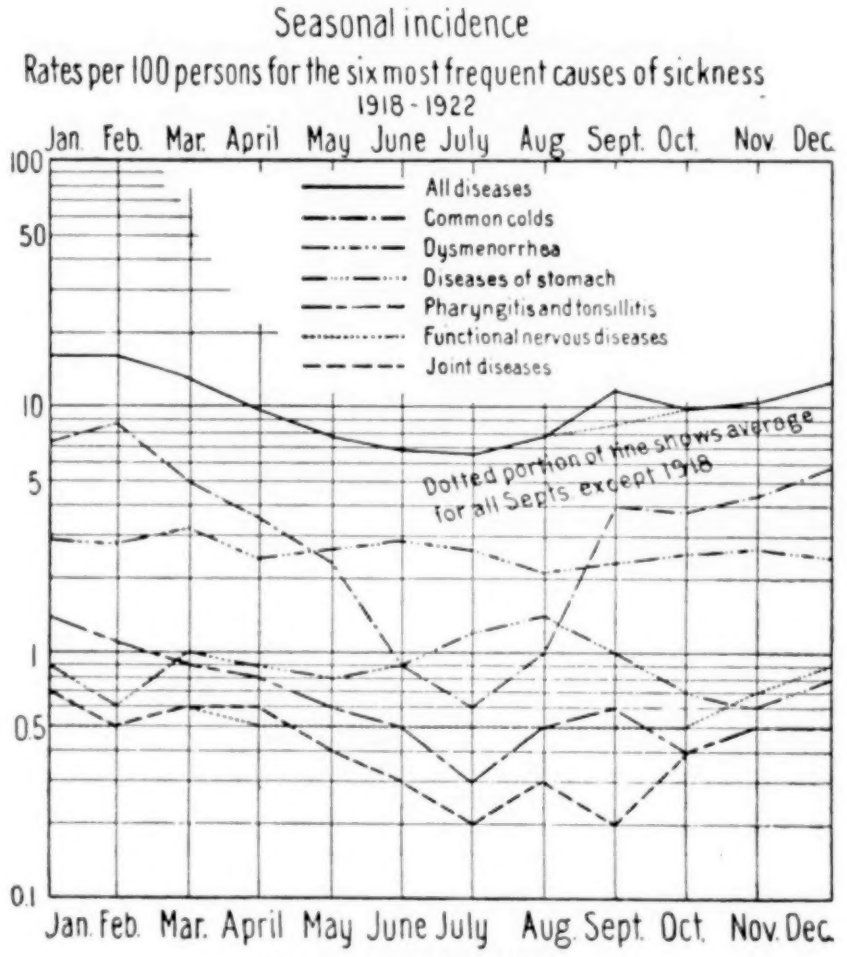


FIGURE 3

showed practically no seasonal influence. Diseases of the stomach showed definite spring and fall increases in the rates, while joint affections showed spring and winter recrudescences, and pharyngitis and tonsillitis a fall and winter rise.

The rates for the day of onset of disease varied within a fairly small range, except that the Sunday rate was very

TABLE 5.—DISEASE ABSENTEEISM (ACCORDING TO DURATION) BY SEX DURING 1918 TO 1922

Absentee Group	Cases Male	Rate per 100 Males	Cases Female	Rate per 100 Females	Total Cases	Rate per 100 Employees
1 day	3,503	38	2,222	106	5,725	51
2 day	2,046	22	746	35	2,792	25
3 day	1,139	12	429	20	1,568	14
4 day	656	7	219	10	875	8
5 day	471	5	177	8	648	6
6 day	431	5	166	8	597	5
Over 10 days	882	10	374	18	1,256	11
All groups	9,409	103	4,871	230	14,280	128

TABLE 6.—DAY OF ONSET OF DISEASE DURING 1918 TO 1922

Day of Week	Number of Cases	Rate per 100 Employees
Sunday	522	4.6
Monday	2,990	26.7
Tuesday	2,426	21.7
Wednesday	2,380	21.3
Thursday	2,229	19.9
Friday	1,738	15.5
Saturday	1,995	17.8
All days	14,280	127.8

low (see Table 6). Monday showed the highest rate, but if the Saturday rate had prevailed for a full day it would have been the highest.

Figure 4 shows the approximate case severity of the three causes of disability—sickness, accidents, and home accidents. The lines were fitted by eye to the various points. It will be noted that accidents show the highest severity, with home accidents and sickness showing less and least severe cases in the order named.

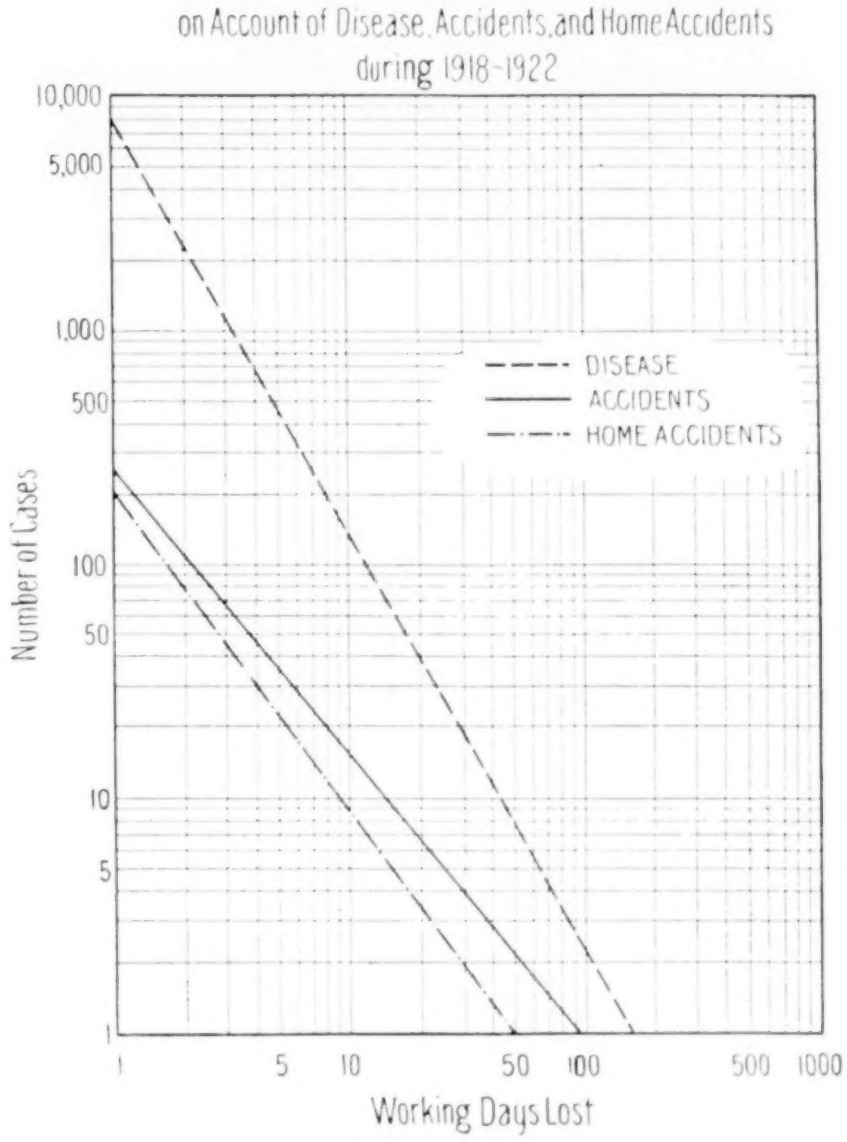


FIGURE 4

Accidents.—Heretofore, considerable attention has been paid to the study of accidents; since this work is concerned mainly with sickness, only a few points were ascertained concerning injuries.

The chief cause of accidents in the Edison experience (see Table 7) was listed under the code number 18, which includes (see code with Fig. 1) so many forms of injury that it is doubtful if this enumeration has any value.[2] The second highest cause of injuries was "struck by falling bodies" and the third was "falls."

TABLE 7.—ACCIDENTS ACCORDING TO CAUSE DURING 1918 TO 1922

Cause Code Number	Number of Cases
18	246
20	91
9	61
3	53
8	50
21	45
2	42
5	41
Other causes	145

[2]This code had been used in filling out the records and later in punching the cards; hence a revision was impossible.

The highest rates for accidents were observed among the 20-29 and the 30-39 age groups (see Table 8). This was quite likely a matter of greater exposure to hazards by the members of those groups.

Table 9 shows the monthly rates for accidents. There is very little fluctuation; the highest points are reached in January, July, and December. Daily onset of accidents (see Table 10) exhibits a phenomenon somewhat similar to that exhibited by daily onset of sickness—*e.g.*, a low rate for Sundays, a high rate for Mondays, and a strikingly high half-day rate for Saturdays. High points were also noted on Wednesdays and Fridays.

TABLE 8.—ACCIDENTS AND HOME ACCIDENTS ACCORDING TO AGE GROUPS DURING 1918 TO 1922

Age Group	Accidents		Home Accidents	
	Number of Cases	Rate per 100 in Age Group	Number of Cases	Rate per 100 in Age Group
10-19	30	0.3	39	0.3
20-29	289	3.1	191	1.7
30-39	255	2.8	118	1.0
40-49	147	1.6	61	0.5
50-59	37	0.4	31	0.2
60+	16	0.1	8	0.0
All ages	774	8.5	448	4.0

TABLE 9.—ACCIDENTS AND HOME ACCIDENTS ACCORDING TO SEASONAL INCIDENCE DURING 1918 TO 1922

Month	Accidents		Home Accidents	
	Number of Cases	Rate per 100 Employees	Number of Cases	Rate per 100 Employees
January	77	0.8	43	0.3
February	47	0.5	40	0.3
March	65	0.7	33	0.2
April	70	0.7	32	0.2
May	56	0.6	50	0.3
June	49	0.5	41	0.3
July	79	0.8	40	0.3
August	61	0.7	29	0.2
September	58	0.6	34	0.3
October	65	0.7	39	0.3
November	72	0.7	34	0.3
December	75	0.8	33	0.3
All months	774	8.5	448	4.0

TABLE 10.—ACCIDENTS AND HOME ACCIDENTS ACCORDING TO DAY OF ONSET DURING 1918 TO 1922

Day of Week	Accidents		Home Accidents	
	Number of Cases	Rate per 100 Employees	Number of Cases	Rate per 100 Employees
Sunday	43	0.5	17	0.1
Monday	129	1.4	99	0.8
Tuesday	123	1.3	78	0.6
Wednesday	132	1.4	68	0.6
Thursday	103	1.1	66	0.6
Friday	128	1.4	58	0.5
Saturday	116	1.2	62	0.5
All days	774	8.5	448	4.0

Home Accidents.—"Home" accidents embrace those injuries that occur at any time when an employee is off duty.

The incidence of home accidents according to age grouping (see Table 8) was highest in the 20-29 and 30-39 age groups, as was noted in the case of accidents. This is probably also a matter of the greatest exposure.

Seasonal distribution showed very little fluctuation; the low points in the rates occurred in March, April, August, and December (see Table 9).

In the daily onset of home accidents, as in the case of sickness and accidents, a low rate was observed on Sunday and a high rate on Monday (see Table 10). Home accidents also showed a strikingly high half-day rate on Saturday.

Cost of Absenteeism.—The cost of industrial absenteeism has in the past caused a great deal of speculation which has, however, failed to approximate very closely the true monetary expenditure. A serious and conscientious attempt has been made in this study to evaluate the important and omnipresent economic factor of lost time due to disability. An important fact to be kept in mind at the outset is that all cases of disability in this series did not receive benefits.

Functional nervous diseases (see Table 11) showed a total amount of bene-

TABLE 11.—BENEFITS PAID FOR THE SIX HIGHEST DISEASES CAUSING ABSENTEEISM DURING 1918 TO 1922

Disease	Number of Cases	Total Benefits Paid	Average Benefit Paid [1]	Average Case Cost [2]
Common colds	5,328	$ 4,898.20	$ 73.10	$ 0.92
Diseases of stomach	1,246	508.20	72.60	0.41
Pharyngitis and tonsillitis	1,007	2,455.20	57.00	2.40
Functional nervous diseases	731	19,923.20	229.00	27.20
Dysmenorrhea	683	951.10	158.50	1.40
Rheumatism, arthritis, and gout	651	8,098.50	168.70	12.60
All diseases	14,280	139,872.40	153.00	9.80

[1] Based on the total amount paid out and the number of cases of benefits.
[2] Based only on benefits paid; does not include other items of expense.

TABLE 12.—BENEFITS PAID FOR ACCIDENTS AND HOME ACCIDENTS DURING 1918 TO 1922

Year	Number of Cases	Number of Benefits	Total Benefits	Average Benefit Paid [1]	Average Case Cost [2]
Accidents					
1918	131	39	$ 1,441.20	$ 36.90	$ 11.00
1919	181	57	3,032.40	53.20	16.70
1920	180	63	5,097.20	80.90	28.30
1921	150	61	5,037.40	82.50	33.80
1922	132	63	5,864.70	93.10	44.40
All years	774	283	20,472.90	72.30	26.40
Home Accidents					
1918	183	6	$ 695.30	$ 115.90	$ 3.70
1919	91	15	1,621.80	108.10	17.80
1920	83	11	2,120.20	192.70	25.50
1921	87	8	573.30	71.60	6.50
1922	104	9	600.30	66.70	5.70
All years	448	49	5,610.90	114.50	12.50

[1] Based on the number of cases of benefits paid and the total amount paid as benefits.
[2] Based only on benefits paid; does not include other items of expense.

TABLE 13.—ESTIMATED LOSS FROM DISEASE, ACCIDENTS, AND HOME ACCIDENTS BY WAGE AND ABSENTEE GROUPS DURING 1918 TO 1922

Wage Group	Disease		Accidents		Home Accidents	
	Number of Cases	Amount Lost	Number of Cases	Amount Lost	Number of Cases	Amount Lost
One Day						
1	31	$ 27.00	0	$ 0.00	1	$ 0.90
2	2,298	5,745.00	24	60.00	40	100.00
3	2,093	8,581.30	46	188.60	42	172.20
4	1,065	6,177.00	37	214.60	24	139.20
5	164	1,230.00	7	52.50	4	30.00
6	43	391.30	1	9.10	4	36.40
7	25	272.50	0	0.00	1	10.90
8	6	75.00	0	0.00	0	0.00
All groups	5,725	22,499.10	115	524.80	116	489.60
Two Days						
1	6	$ 10.80	0	$ 0.00	1	$ 1.80
2	894	4,470.00	18	90.00	30	150.00
3	1,079	8,847.80	49	401.80	30	246.00
4	661	7,667.60	36	417.60	19	220.40
5	106	1,590.00	5	75.00	3	45.00
6	25	455.00	1	15.00	3	54.60
7	9	196.20	0	0.00	0	0.00
8	12	300.00	0	0.00	0	0.00
All groups	2,792	23,537.40	109	999.40	86	717.80
Three Days						
1	7	$ 18.90	0	$ 0.00	1	$ 2.70
2	418	3,135.00	8	60.00	10	75.00
3	631	7,761.30	31	381.30	18	221.40
4	412	6,756.80	25	410.00	11	180.40
5	56	1,260.00	3	67.50	0	0.00
6	45	955.50	1	27.30	0	0.00
7	2	65.40	1	32.70	0	0.00
8	7	262.50	0	0.00	0	0.00
All groups	1,578	20,215.40	69	978.80	40	479.50
Four Days						
1	6	$ 21.60	0	$ 0.00	0	$ 0.00
2	218	218.00	7	70.00	12	120.00
3	341	5,592.40	20	328.00	19	311.60
4	255	5,916.00	19	440.80	9	208.80
5	38	1,140.00	3	90.00	3	90.00
6	8	291.20	0	0.00	1	36.40
7	4	174.10	0	0.00	0	0.00
8	5	250.00	0	0.00	0	0.00
All groups	875	13,603.60	49	928.80	44	766.80

fits paid and an average case cost far in excess of all the other principal diseases. Rheumatism, arthritis and gout were rated second highest, using the same standard. Both of these computations were direct functions of the average time lost per case (see Table 1). Pharyngitis and tonsillitis, which also had a high severity rate, were third with an average case cost of $2.40. The lowest average case cost was chargeable to diseases of the stomach. The average case cost for all diseases was $9.80.

A consistent increase in the average case cost of accidents by years was observed (see Table 12). This was due mainly to an increase in wages; reference to the table will elicit the fact that the number of cases did not vary a great deal from year to year. The average case cost of accidents for all years ($26.40) was considerably higher than that of disease.

Definite fluctuations of the average case cost by years were noted for home accidents (see Table 12). This relation appears to be a partial function of the number of cases receiving benefits, al-

TABLE 13.—*Continued*

Wage Group	Disease		Accidents		Home Accidents	
	Number of Cases	Amount Lost	Number of Cases	Amount Lost	Number of Cases	Amount Lost
			Five Days			
1	3	$ 13.50	0	$ 0.00	0	$ 0.00
2	204	2,550.00	12	150.00	9	112.50
3	248	5,084.00	16	328.00	10	205.00
4	150	4,350.00	14	406.00	6	174.00
5	30	1,125.00	1	37.50	3	112.50
6	9	409.50	1	45.50	0	0.00
7	3	163.50	0	0.00	0	0.00
8	1	62.50	0	0.00	0	0.00
All groups	648	13,758.00	44	967.00	28	604.00
			Six Days			
1	5	$ 27.50	0	$ 0.00	0	$ 0.00
2	171	2,565.00	8	120.00	6	90.00
3	240	6,000.00	24	600.00	12	300.00
4	137	4,795.00	11	385.00	8	280.00
5	32	1,440.00	2	90.00	1	45.00
6	5	275.00	1	55.00	0	0.00
7	4	260.00	0	0.00	0	0.00
8	3	225.00	0	0.00	1	75.00
All groups	597	15,587.50	46	1,250.00	28	790.00
			Seven to Ten Days			
1	10	$ 76.00	0	$ 0.00	1	$ 7.60
2	282	5,978.40	14	296.80	13	275.60
3	279	9,709.20	26	904.80	13	452.40
4	203	10,007.90	35	1,725.50	11	542.30
5	32	2,038.40	1	63.70	3	318.50
6	5	386.50	4	309.20	0	0.00
7	4	370.40	0	0.00	0	0.00
8	4	424.80	0	0.00	0	0.00
All groups	819	28,991.60	80	3,300.00	41	1,596.40

though it was undoubtedly influenced also by case severity. The average case cost of home accidents for all years ($12.50) was much lower than that of accidents and somewhat higher than that of disease.

Since the Edison benefit plan provided for the transference of every case of absenteeism to the benefit fund on the fifteenth consecutive day of disability, and also for the payment of full salary by the various departments up to the time of transference, it was thought that a conservative estimate of these payroll amounts might give some interesting approximations of the economic losses due to short periods of disability.

TABLE 14.—CASE FREQUENCY, AGGREGATE AND CASE TIME LOSS, AND ESTIMATED COST PER CASE AND PER EMPLOYEE FOR ALL CAUSES OF DISABILITY

Cause of Disability	Number of Cases	Total Working Days Lost	Average Number of Working Days Lost per Case	Average Number of Working Days Lost per Employee	Average Case Cost[1]	Average Cost per Employee[1]
Sickness	14,280	83,280	5.8	7.4	$19.40	$24.80
Accidents	774	13,221	17.1	1.1	38.00	26.30
Home Accidents	448	3,377	7.5	0.3	24.60	1.00
All causes	15,502	99,878	6.4	8.9	20.50	28.50

[1] Cost is here based solely on benefits paid and estimates of salaries paid out before transference to benefit fund (on the fifteenth day of disability). Other items of expense are not included.

Table 13 was made by computing a mean wage for each of the eight wage groups and finding the daily rates for the various periods of absence as shown, thereby arriving at an estimate of the salaries paid during disability. As was to be expected, these amounts were very much larger in the case of disease than in the case of accidents or home accidents. (All tabulations were based upon *working* days lost.) The salary loss averaged $2.10 per case per year for disease, $2.30 for accidents, and $2.40 for home accidents.

Table 14 summarizes the case frequency, aggregate and case time loss, and the estimated cost per case and per employee, based upon the data given in Table 13, for all causes of disability.

Influence of Occupation and Departmental Environment upon the Incidence of Sickness and Accidents.—The details of this part of the study cannot be given here on account of lack of space, but are included in the full report. A general statement of the results, however, can be made.

Meter testers, firemen, clerks, auto repairmen, foremen and assistants, stenographers, and trimmer-patrolmen scored rates above the average in the six principal diseases. Meter testers and firemen scored high rates in four diseases, clerks in three, auto repairmen in two, and foremen and assistants, stenographers, and trimmer-patrolmen in one each.

The departments of installations, billing, transportation, general service, appliance, generating, electrical engineering, accounting, and maintenance of lines scored rates above the average in the principal diseases. Installations scored high rates in all six diseases, billing in five, transportation in four, general service in three, appliance and generating in two each, and electrical engineering, accounting, and maintenance of lines in one each.

Firemen, auto repairmen, linemen, first class, trimmer-patrolmen, and laborers showed a higher rate than the average for accident incidence.

The departments of transportation and generating had rates above the average for the occurrence of accidents.

V. Discussion and Recommendations

Since the Edison experience has shown that sickness causes twenty times as many cases of absenteeism as accidents and is responsible for seven times as much loss of time from work, it would seem rational that any program for solving the problem of lost time would give results if money was intelligently used to further disease prevention. This does not mean that vigilance should be relaxed in the slightest degree in attempting to prevent accidents. Accident prevention has received so much attention in the past, however, that it now seems evident that emphasis might profitably be placed on earnest attempts to thwart the inroads of disease in industrial establishments.

The Edison disease problem is one of dealing with the incidence of upper respiratory infection, dysmenorrhea, digestive disturbances, and functional nervous disorders.

Common Colds.—Common colds so far outstrip all other diseases in their occurrence that it is reasonable to consider them first. In the beginning one may profitably turn to an editorial writer of the *Lancet* (1):

> Colds are certainly an object of statistical interest if numerical frequency is an element of statistical interest. Now the "cold" may be a "Ding an sich" or it may be the prelude of a more important "Ding." Perhaps it may be suggested that an enumeration of the "colds" which did and those which did not

lead up to something else might be the basis of a statistical inquiry. But the research does not seem a promising one. It might enable the practitioner confronted with a husky panel patient to assert that the chance is 1 in 100 that he will soon have to treat him for phthisis, 3 in 100 that lobar pneumonia will develop, and so on, but this arithmetical information will gratify nobody save a chimera identified by the cartoonist of the *Daily Mirror* with an official of the Ministry of Health. But if one collected statistics of "colds" upon a slightly different plan, the results might be more rewarding. Do the "colds" of sedentary workers last longer than those of the out-door workers? *Ceteris paribus*, does keeping the house answer better than going out? Is it true that "summer colds" are the most intractable? Is the mode of onset of a common "cold" of any importance in its prognosis as to severity and duration? Is there a secular change of type in the common "cold"? These are all questions not of life and death, but of importance to health and happiness. It is difficult to see how they can be answered unless the numerical method brings into this humbler sphere that replacement of "vague adjectives" by "exact numerical standards" of which Simon spoke. The common "cold" has been termed the opprobrium of the profession; perhaps we have held our heads too high and dreamed too many bacteriological dreams, forgetting that the first word must be said before the last can be added.

Opinions are somewhat diverse as to just what constitutes the most important causative factor of colds. An editorial writer in the *Journal of the American Medical Association* (2) believes that isolation might check spray infection and that known contacts should be kept under special surveillance; that there is no single and universal method for the prevention of the transference of germs from one respiratory tract to another, but all reasonable attempts to prevent spray infection should be worth making; measures are taken to check the spread of other diseases, why not restrain the indiscriminate cougher and sneezer? Leonard Hill (3) feels that very warm air predisposes to disease. It causes swelling and engorgement of the nasal mucous membrane, which, when subjected to the influence of cold air, becomes paler but remains swollen. This condition, he believes, reduces the immunization properties of the blood plasma, the cleansing action of the nasal cilia and the phagocytic properties of the white blood cells, thus allowing bacteria a suitable nidus in the still swollen membrane. Foster (4) has contended that colds have been produced experimentally by the injection of a "filterable virus" taken from animals having coryza. Tobey (5) has maintained that a cold usually is the result of some irritative process in the nose, due to unfavorable surroundings, and thinks that there is a difference between acute coryza and the true nasal infection, believing that there are two avenues of infection, first, the invasion of saprophytic bacteria when the resistance of the individual is lowered by some unhealthy habit or effect of the environment and, second, droplet infection by people who are having acute attacks. He strongly advises abortive measures and outlines treatment. In a recent study of common colds by the Metropolitan Life Insurance Company (6) the opinion was voiced that in the prevention of respiratory infection we are dealing with two important factors, the annual downward swing of the temperature and the possible relationship of minor infections which begin in the fall and early winter to those that occur later; that the first factor "can be compensated to a degree by proper attention to clothing and to the ventilation and heating of our homes, workplaces, and means of transportation," whereas further study is needed on the latter factor. Stevens (7), under whose direction a series of plays depicting in a forceful way what one should do to

avoid colds was given in a Boston department store, believes that "dramatizing" health information is productive of good results. Although he has had no opportunity for comparison of his experience, he bases his belief on the fact that while the records of the store showed that the number of cases of colds reporting was about 95 per cent. of those presenting themselves during the winter previous to the institution of this form of health propaganda, the loss of time was only 50 per cent. as great. Rosenau (8) has expressed the opinion that the problem of the common cold will likely be solved in the laboratory. There are two investigations now in progress that may lead to the acquisition of useful and additional information, one under the auspices of the United States Public Health Service. Jordan *et al.* (9) recently published a report showing that 64 per cent. of 2,388 students questioned believed that their colds resulted from a strain on the heat regulating mechanism of the body.

Whatever view one takes of the various etiologic factors involved, the following suggestions are offered as possible means of improving the situation:

1. A scientific investigation of the prevalence of high temperatures, inadequate air exchange, and other unhealthful aspects of ventilation as now practised in the company's plant, and the institution of suitable measures to correct these possible defects.

2. Consideration of the use of shower baths by workmen whose occupations necessitate working in a hot room, causing the production of perspiration. It is especially important that such workers should make use of shower baths before going into cooler atmospheres.

3. Encouragement of all employees who have colds and are apparently not sick enough to leave work, and of all those who "feel a cold coming on," to come to the dispensary for treatment, so that abortive measures may be instituted.

4. Intelligent use of propaganda in the form of lectures, demonstrations, and other kinds of publicity in teaching what we now believe are important unhygienic factors in the production of colds.

5. Collection, tabulation, and evaluation of data involving the various factors concerned in the etiology, mode of spread, and course of common colds among the Edison employees.

Dysmenorrhea.—This is probably the greatest cause of lost time in industry for female workers. Mosher has commented on the relation of posture to pelvic conditions (10). She found that there was a direct relationship between bad posture, pelvic displacements, and subsequent pelvic disturbances. She believes that sitting doubled over books produces an anteflexion, which is perhaps the most common cause of menstrual pain in young women. She also believes that in the "débutante's slouch" the uterus is pulled toward the elevated hip; that there are two bad postures, the first, resting the weight on the heels, causing the pelvis to drop backward, and the second, habitually resting the weight on one foot, thus tilting the pelvis.

Meaker (11) has divided women who have menstrual difficulties into three classes: (*a*) those who do their work without complaint, but with lowered efficiency; (*b*) those who begin their work, but are obliged to report to the rest room or dispensary; (*c*) those who stay at home for a full day or longer. On the first group no statistics are available. A survey of a factory, two department stores and a telephone ex-

change, comprising approximately 8,000 cases, showed from 5.1 to 12.2 per cent. of the women reporting to the rest room. Nearly half of these employees received a hot drink and returned to work after resting a few minutes. Others rested for longer periods. It was difficult to obtain figures in regard to the third group on account of the fact that many short absences were listed "for personal reasons." Meaker suggests the provision of a rest room with cots, with a tactful nurse in attendance and a physician available for consultation if needed. Hot water bottles, hot drinks and suitable drugs should be dispensed. The real problem, as he sees it, is to bring the subject to the attention of the girls in such a way that their co-operation may be secured in obtaining advice and treatment when indicated. The matter may be properly introduced at the time of hiring and upon the reporting of the patient to the dispensary for treatment.

Sturgis (12) has recorded a department store experience based on 2,077 cases among a working force of 3,000 women. Each employee was questioned as to discomfort, pain, loss of time, and methods of relief, and the records were then classified as follows:

0. Those who experienced no discomfort and those who felt a slightly lowered efficiency, but worked without complaint.

1. Those who began work, but were later compelled to seek relief such as a hot drink, water bottle, rest, or medication.

1.2 Those who occasionally remained at home or went home on the first day but at other periods suffered little or moderate pain or discomfort.

2. Those who were compelled to remain at home for one or more days of each period.

A.M. Menopause from operative procedures.

N.M. Menopause from natural causes.

Using the foregoing code the following table was made, based on the histories of 2,077 women between the ages of 16 and 60:

	0	1	1.2	2	A. M.	N. M.
Married	520	148	27	28	13	65
Single	737	398	64	63	0	14

Thus 60 per cent. of the women were able to continue work uninterruptedly (plus the 5 per cent. who had no trouble because of normal menopause); 26.3 per cent. had pain or discomfort which necessitated remedies or rest. These, with group 1.2, could be benefited by education along hygienic lines. Group 2 (4.4 per cent.) constituted the real problem. They probably represented some form of pelvic pathology or endocrine disturbance. The management of cases was directed along the following lines:

1. Talks by physicians to women "sponsors" who passed the information to small groups of employees.

2. Talks at the physical examinations.

3. Nurse in attendance at rest room.

4. Recommendation of difficult cases for consultation with physician.

5. Medical passes issued only in exceptional cases. A special study of repeaters was made.

The following suggestions based upon these and other experiences were made for the guidance of the Edison Company in working out this problem:

1. Placing a detailed history of menstrual habits on the examination form, with hygienic advice at the time of examination for employment.

2. The use of a special form for each case of dysmenorrhea, showing in detail the characteristics of each case, and

future analysis of the data thus obtained.

3. A special study of repeaters and cases showing long absentee records, with tactful recommendation of special examination to ascertain the pathological cause of trouble.

4. Special talks by women "sponsors" appointed for the purpose.

5. Provision for a rest room with nurse in attendance.

6. The engendering of a spirit of helpful co-operation among women who have menstrual difficulties, so that they will be encouraged to help in the solution of the problem.

Digestive Disturbances. — Disturbances of digestion were more common among men than among women in the Edison Company. It is rather disconcerting how little people in general know about what and how they should eat.

1. A series of informal talks, supplemented by posters and signs, would perhaps aid in this connection. The human mind will gradually absorb and believe the thing that it constantly sees and hears.

2. Some provision should be made whereby employees would not be obliged to eat in the workrooms.

3. A questionnaire into the eating habits of employees, skilfully handled, might yield some useful information.

Functional Nervous Diseases.—These were the most costly per case of the six principal diseases studied in detail. What can be done to cut down the incidence of these maladies?

1. Reporting, by foremen or heads of departments, of those persons who display queer behavior and are frequently "out of sorts."

2. Reasonable observation and study of those so reported.

3. A detailed study of repeaters and long-time absentees with tactful handling and recommendation for special mental examination, when deemed expedient.

4. Co-ordination of the personnel, medical, and employment departments to solve the problem of apparent maladjustment.

General Considerations.—There are certain general considerations which should receive attention. Short time absences are a very great drain upon the company. Some procedure should be suggested whereby these short periods of lost time can be reduced. Bonus systems have been tried out in a number of organizations but with little success (13). The present custom of the Edison Company is for the company's doctor or a local doctor to visit all absentees within a maximum period of thirty-six hours after the onset of sickness. This takes the time of a highly trained man and is a source of great expense. It would appear that the following ideas might be of help:

1. That a visiting nurse call at the home and report on all absentees within a maximum period of thirty-six hours after the onset of the illness, cases of critical illness to be referred to the company physician.

2. That each absentee, upon returning to work, be required to report to the medical director, who will secure a detailed history of the illness and decide what the malady was.

3. That a special sick committee be appointed from the employees in each department and that they be empowered to question returning absentees as to the cause of their staying away from work. (This plan has already been tried in one department with the result that the absenteeism was reduced 300 per cent. in the period November, 1923, to March, 1924.)

4. That due consideration be given to an adjustment of the number of sick days granted, based on the duration of service, with the possibility of allowing only two-thirds pay for absence credits when the employee has been in the service less than two years.

VI. Proposed Plan for Future Studies

A study such as the present one is most useful when there are comparative data in similar industries, whereby it may be duly ascertained whether any given experience is extraordinary or commonplace. Accordingly, it would seem rational that the next step in statistical work of this nature would be to consider the creation of the needed mechanism whereby morbidity and accident data could be collected, tabulated, and analyzed from the records of other companies which are also engaged in the manufacture and sale of electric power throughout various parts of the country. Once the necessary co-operation of such a group of organizations is obtained, the further survey of the accumulated material might proceed along the following lines:

1. The standardization of occupations and departments; job analysis of the various occupations, and surveys of the environmental factors in the various departments.

2. Nationality incidence and its relation to disease, lost time, and disease benefits.

3. Marital state—its occurrence and relation to disease, lost time, and benefits.

4. Duration of service and its possible connection with sickness, accidents, time lost, and benefits paid.

5. The monthly, daily, and hourly fluctuation of sickness and accidents.

6. A survey of lost time based both upon calendar days lost (adopted by the industrial medical directors of the American Association of Physicians and Surgeons, December 18, 1923, as best indicating sickness and accident severity) and upon working days lost (because of the importance of computing the economic loss to industry).

7. The use of the classification of causes of disability recently suggested by the American Association of Industrial Physicians and Surgeons.

8. A special code of types of accidents, based upon suggestions received from the various companies concerned.

9. The formation and use of a standardized scale of wage grouping applicable to all employees included in the proposed study.

10. Benefits paid, in their relation to various diseases, accidents, occupations, departments, marital status, age grouping, duration of service, and time of onset.

11. A detailed study of common colds, covering the following points:

a. Age
b. Sex
c. Marital status
d. Habits of personal hygiene
e. Probable exposure and onset
f. Course and sequelae
g. Special examinations
h. Occupational influences
i. Departmental environment
j. Lost time
k. Cost
l. Influence of atmospheric temperature
m. Correlation of these factors

12. A detailed survey of dysmenorrhea taking into account

a. Age
b. Marital status
c. Habits of personal hygiene
d. Classification of severity as suggested by Sturgis
e. Course and sequelae
f. Special examinations
g. Occupational influence

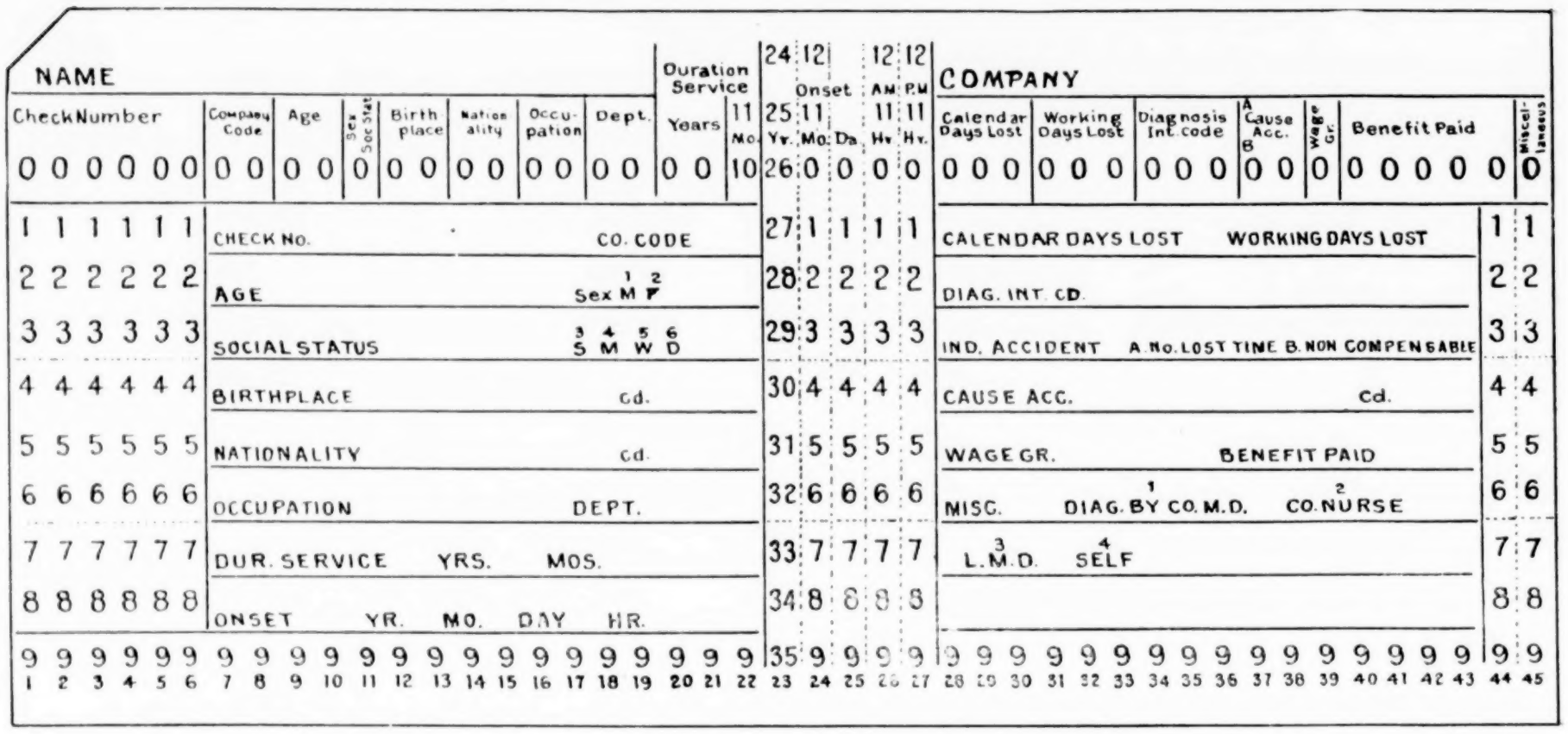


FIGURE 5.—Card form suggested for general use.

h. Departmental environment
i. Lost time
j. Cost
k. Correlation of these factors

13. A detailed study of diseases of the stomach covering

a. Age
b. Sex
c. Marital status
d. Habits of personal hygiene
e. Course and sequelae
f. Special examinations
g. Occupational influences
h. Departmental environment
i. Lost time
j. Cost
k. Correlation of these factors

14. A detailed survey and analysis of functional nervous disease in relation to

a. Age
b. Sex
c. Marital status
d. Habits of personal and mental hygiene
e. Reports by foremen and executive heads as to queer behavior
f. Course and sequelae
g. Special examinations
h. Occupational influences
i. Departmental environment
j. Lost time
k. Cost
l. Correlation of these factors.

15. An inquiry into the occurrence and causation of accidents with especial reference to previous work done along this line; the evaluation of the usual hazards with proper regard for the man-hours of exposure in this group of industries.

16. A consideration of the use of endemic indices for sickness by the several plant physicians with the possibility of instituting regular morbidity reporting to a central bureau for subsequent analysis and publication.

17. The formulation of a plan similar to that of the National Cash Register Company of Dayton, Ohio, where the foreman rates each employee every six months (A-B-C-D) on (*a*) physical appearance, (*b*) endurance, (*c*) freedom from illness, (*d*) personal neatness. If a worker receives a rating of C or D, he is referred to the medical department for consideration or examination if deemed expedient.

18. A proper provision for the use of standardized record forms for the special detailed studies previously mentioned. The card shown in Figure 5 is suggested as a form for general use.

The author desires to express his sincere

thanks to all those who have aided in the prosecution of this study; special acknowledgments should be made to Dr. Wade Wright of the Industrial Clinic, Massachusetts General Hospital; to Professor Edwin B. Wilson, Department of Vital Statistics, Harvard School of Public Health; and to Mr. H. W. Moses, Employment Superintendent of the Edison Company, for their interest and valuable suggestions.

BIBLIOGRAPHY

1. Medical Statistics. Editorial. Lancet, 1921, *1*, 985.
2. The Importance of Mouth Spray Infection. Editorial. Jour. Am. Med. Assn., 1917, *69*, 1268.
3. Hill, L.: Quoted in editorial, "Cold in the Head." *Ibid.*, 1916, *66*, 1201.
4. Foster, G. B.: The Etiology of Common Colds. *Ibid.*, 1916, *66*, 1180.
5. Tobey, H. G.: Common Colds in Relation to Industrial Hygiene. THIS JOUR., 1921-1922, *3*, 333.
6. One Year of Common Colds and Associated Infections. Statis. Bull. of Metropolitan Life Ins. Co., New York, Nov., 1923.
7. Stevens, H. W.: Personal Communication. April 10, 1924.
8. Rosenau, M. J.: Personal Interview, April 11 1924.
9. Jordan, E. O., Norton, J. F., and Sharp, W. B.: The Common Cold. Jour. Infect. Dis., 1923, *33*, 416.
10. Mosher, E. M.: Habit Postures in Relation to Pelvic Conditions. Med. Rec., 1917, *91*, 583.
11. Meaker, S.: A Preliminary Note on Dysmenorrhea as an Industrial Problem. THIS JOUR., 1922-1923, *4*, 49.
12. Sturgis, M. C.: Observations on Dysmenorrhea Occurring in Women Employed in a Large Department Store. *Ibid.*, 1923-1924, *5*, 53.
13. A Report on Absenteeism and Tardiness. Policyholders' Service Bureau of Metropolitan Life Ins. Co., New York.

CARBON MONOXIDE HAZARD IN PUBLIC GARAGES*

ETTORE CIAMPOLINI, M.D., PH.D.
Medical Inspector, Division of Industrial Hygiene, New York State Department of Labor

CONDITIONS IN NEW YORK

A cursory glance at the statistical data in the manual compiled by the National Automobile Chamber of Commerce (1) will impress upon the mind the tremendous growth of the automobile industry in the United States, and, in particular, the increase of motor vehicles and of employment dependent on their use in the state of New York.

The registration of motor vehicles in New York State in 1922 was 1,002,293, a gross gain of 190,262 vehicles, or 19 per cent., over 1921. The registration of motor vehicles in New York City, all boroughs included, in 1922 was as follows:

Motor cars	216,516
Trucks	67,397
Taxicabs	16,369
Buses	700
Total motor vehicles	300,982

The number of service stations, repair shops, and garages in the state in 1923, according to the Chilton Automobile Trade List (2), was 9,578—5,206 service stations and repair shops, and 4,372 garages. In New York City, all boroughs, in 1922 there were 961 service stations, with an average of 312 motor vehicles per station. According to the Fourteenth Census of the United States in 1920 there were 49,465 chauffeurs and 2,606 workers in garages in the state of New York (3).

The following figures showing the receipts from taxes on motor vehicles and chauffeurs' licenses in 1922 are taken from the Report of the State Tax Commission for 1922:

	New York City	*New York State*
Motor vehicles	$4,831,018	$12,276,389
Chauffeurs' licenses	280,031	459,975
Total receipts	$5,111,049	$12,736,364

Like housing conditions, which are justly recognized as acute on account of overcrowding, garaging conditions in New York City are far from being ideal. The rapid growth of the use of the automobile has brought with it a train of makeshifts in "garaging" which, in certain sections of the city, fall well within the borderline of permanent health hazards.

METHOD OF STUDY

This study of the health hazard to garage workers from carbon monoxide was planned by the Division of Industrial Hygiene and was carried out with the courteous and material help of Dr. James B. Clemens of the New York Academy of Medicine. It was begun in the first part of November, 1923. All through the month there was, as a rule, either no wind or only moderate winds, with prevailing cold weather which caused garage doors to be left closed.

Lists of all garages by streets in the borough of Manhattan were prepared and the garages were visited systematically, beginning with those located in the lower east side, to which this study

*Received for publication March 7, 1924.

is limited. Over 157 garages, service stations, and repair shops were inspected. They included all types and sizes, as several large and modern garages were chosen at random in other parts of the city for purposes of comparison, but the findings in such cases are not included in this study.

A first failure must be reported here. All efforts to induce garage workers, and chauffeurs when present, to part with a few drops of blood from the ear were unsuccessful in over 80 per cent. of the garages visited. In thirty-one garages an average of only one or two persons per garage, with a maximum of three chauffeurs in one garage, cooperated satisfactorily. Almost everybody seemingly was interested in the subject of carbon monoxide poisoning, but after prolonged conversation, tending often to become jocular in character, the request of the inspector that the employees submit to the simple test was dismissed with a finality not admitting any doubt. Altogether forty-two men were tested.

For the quantitative determination of carbon monoxide in the blood the pyro tannic acid method as described by Sayers and Yant (4) in 1922, and later developed and greatly simplified by them and their associates (5) in 1923, was adopted. A compact and convenient field apparatus, sold by the Mine Safety Appliances Company of Pittsburgh, Pa., was used. Both the method and the apparatus require very simple technic and have been entirely satisfactory and of great service in this study. The percentage of hemoglobin was determined by the Tallqvist scale, 90 being considered as normal.

On account of various difficulties involving great loss of time, the ambitious aims of the investigation were curtailed, and therefore this study cannot claim to be exhaustive, but serves only as an index of garaging conditions in one part of the city.

FIGURE 1

FORM A

EXAMINATION OF EMPLOYEES IN GARAGES

No._____

Date_____

Address_____

Name_____ Age_____

Length of employment_____ Previous employment_____ Length_____

Skin conditions_____

Pruritus_____

Pallor_____ Flushed_____

Nausea_____

Headache_____ Frontal_____ Occipital_____ Temporal_____

Photophobia_____ Tremors_____

Insomnia_____ Narcotics_____

Hours at work: From_____ to_____

Heavy physical work { Mechanic / Pusher / Washer / Chauffeur

	1st Test	*2nd Test*
	Time of day	Time of day
	Pulse	Pulse
	Respiration	Respiration
	Hb	Hb
	Polycythemia	Polycythemia
	CO	CO

Analysis of Findings

Two blank forms were prepared for recording the findings—Form A, for the examination of garage workers, and Form B, for the inspection of garages (see Figs. 1 and 2).

Figure 2

Form B

INSPECTION OF GARAGES

No._____

Date_____

Address_____

Dimensions: x x = cu. ft. Number of floors_____

Number of doors_____ Level with drive_____ Closed_____ Open_____

Separate entrance and exits_____ On same plane_____ Opposite_____

Number of windows_____ Closed_____ Open_____

Number of skylights_____ Closed_____ Open_____

Ventilators_____ Functioning_____

Exhausts_____ Functioning_____

Lighting: Daylight { Good / Fair / Poor } Artificial { Good / Fair / Poor }

Service: Repairs_____ Service Station_____ Storage_____

Types of cars { Taxis / High-priced cars / Low-priced cars / Trucks }

Movements of cars { From 6 A.M. to 12 Noon / From 12 Noon to 6 P.M. / From 6 P.M to 6 A.M. }

Exhausts on cars_____

Number of employees_____

1st sample of air, CO content	2nd sample of air, CO content
Time of day_____	Time of day_____
Wind_____	Wind_____
Temperature_____	Temperature_____
Humidity_____	Humidity_____

As the tests were originally planned, provision was made for two consecutive examinations of the garage air and of the garage workers' blood at different hours on the same day for comparative study, but in practice it was not possible, even once, to get any man to submit to a second test. The most salient findings recorded on Forms A and B are given in Tables 1 and 2.

An analysis of Table 1 shows that in 69.5 per cent. of the workers examined the test for carbon monoxide was positive. Not all of the men examined in garages where the carbon monoxide concentration in the air was demonstrable showed a corresponding percentage of carboxyhemoglobin or gave a positive test at all; conversely, in some garages, where it was not possible to demonstrate any carbon monoxide in the air, some men gave a positive test for carboxyhemoglobin. These apparent discrepancies are easily explained. If only a moderate amount of carbon monoxide has been absorbed, it may be thrown off in a few hours, the rate of elimination being from 30 per cent. to 50 per cent. per hour (6), depending on the amount of fresh air breathed. Furthermore, it is possible for a mechanic testing and adjusting a car for one hour to absorb enough carbon monoxide to show a carboxyhemoglobin saturation of 22 per cent. when the concentration of carbon

TABLE 1.—TABULATION OF DATA ON GARAGE EMPLOYEES AS RECORDED ON FORM A[1]

No. of Employee	Age	Years of Employment	Kind of Work	Hours at Work	Headaches	Nervous Manifestations	Gastric Symptoms	Skin Manifestations	Pulse Rate	% of Hb	% of COHb	Remarks
1	50	7	M.	2	F.Oc.T.	+	+	−	82	85	18	
2	20	4	M.	3	F.	−	+	−	78	90	10	Marked pallor, temp. 99.4
3	19	2	M.	1	Oc.	−	−	−	76	90	0	
4	30	12	M.	4	F.Oc.T.	+	+	P.	90	80	30	
5	25	10	M.	3	F.	−	−	P.	79	80	18	
6	32	12	M.	1	Oc.	−	−	−	69	90	0	
7	24	3	M.	2	F.	−	+	P.	78	90	0	
8	36	1	M.	2	Oc.	−	−	−	68	90	0	
9	36	15	M.	4	F.Oc.	+	+	P.	98	85	10	
10	40	25	M.	3	Oc.	−	−	−	64	90	0	
11	25	5	C.	1	T.	—	—	P.	82	70	0	Insomnia; narcotics
12	29	5	M.	3	F.	+	−	P.	96	90	10	
13	20	6	M.	2	F.	−	+	P.	87	90	20	
14	37	2	M.	1	Oc.	−	−	P.	79	90	18	Insomnia
15	48	15	M.	2	F.	−	+	P.	74	90	10	
16	17	2	M.	4	Oc.	−	−	P.	96	85	15	
17	23	4	C.	2	Oc.	−	−	−	78	90	10	
18	31	7	M.	3	F.	−	+	P.	79	90	15	
19	30	9	M.	1	F.	−	+	−	80	85	18	Insomnia
20	23	4	M.	1	F.	−	+	−	87	90	10	
21	22	1	M.	4	F.	−	+	P.	81	90	20	
22	22	1	C.	3	Oc.	−	−	−	75	90	0	
23	29	2	C.	3	F.	−	−	−	70	90	10	
24	21	2	C.	0	Oc.	−	−	−	81	90	0	
25	16	1	M.	1	Oc.	−	−	P.	89	90	15	
26	28	3	M.	1	Oc.	−	−	P.	74	90	0	
27	47	19	M.	3	F.	−	+	P.	73	90	10	Insomnia
28	32	4	M.	3	Oc.	−	−	P.	84	90	10	
29	27	6	C.	1	Oc.	−	−	−	68	80	0	
30	41	7	M.	3	F.	−	+	P.	73	90	10	Insomnia
31	39	2	M.	1	Oc.	−	−	−	—	85	0	
32	32	5	C.	½	Oc.	−	−	−	67	90	0	
33	29	5	M.	3	Oc.	−	−	−	87	90	15	
34	27	6	M.	2	Oc.	−	−	P.	79	90	10	
35	47	25	M.	3	Oc.	−	−	−	74	80	10	
36	39	17	M.	3	Oc.	−	−	P.	81	90	15	
37	24	2	M.	2	F.	+	+	P.	87	90	10	
38	29	2	M.	2	F.	+	+	P.	94	90	20	
39	23	1	M.	4	F.Oc.	+	+	P.	83	85	20	
40	31	15	M.	2	Oc.	−	−	−	79	90	10	
41	21	4	M.	1	Oc.	−	−	P.	70	80	10	
42	18	4	M.	1	Oc.	−	−	P.	65	85	0	Narcotics

[1] KIND OF WORK: M. = mechanic; C. = chauffeur.
HEADACHES: F. = frontal; Oc. = occipital; T. = temporal.
SKIN MANIFESTATIONS: P. = pallor.
+ indicates that symptoms were present; −, that they were absent.

monoxide in the air of the garage may not have reached four parts in 10,000 (6). A test in a large garage of the air surrounding a car with the engine running, taken 10 feet from the exhaust and at a height of 4 feet from the floor, showed ten parts of carbon monoxide in 10,000 (0.1 per cent.), while in other parts of the garage, 30 feet from the car, it was not possible to obtain a positive test.

Headaches were common in almost all cases, and gastric symptoms were present in many, although not all the men examined were willing to admit any discomfort due to their occupation. Pallor of the skin was general in greater or less degree. Although the pulse rate was not markedly changed by the carbon monoxide found in the blood of those examined, even allowing for wide normal limits of variation it showed a tendency to increase.

An unexpected finding was the amount

of hemoglobin present. The pallor of the face, almost of waxy hue in some cases (see Table 1, No. 3) but generally sallow, suggested blood disease due to absolute or relative reduction of hemoglobin, but in all cases, excepting one (see Table 1, No. 11) in which the marked pallor might have been due to the use of narcotics, the hemoglobin was normal or nearly normal. Unfortunately a routine microscopic examination of the blood was not possible, but in case No. 3 (Table 1) the blood findings were: red count 4,500,000; stained specimen normal, except for the presence of a few macrocytes. A compensatory polycythemia (7) may account for the percentage of hemoglobin present. The alteration of the color of the skin, if I may venture to express an opinion, may be dependent upon disturbances of the subcutaneous circulation of nervous origin.

Despite the facts that the values for carboxyhemoglobin in Table 1 were but approximate and that the workers who volunteered to be examined were only those who felt themselves to be in a certain state of invalidism, the test nevertheless demonstrates the existence of a health hazard in the occupation of garage workers.

TABLE 2.—TABULATION OF DATA ON INSPECTION OF GARAGES AS RECORDED ON FORM B

No. of Garage	Daily Movement of Cars	Type of Cars	Service Given[1]	No. of Doors	No. of Windows	No. of Skylights	Ventilation	% of CO in Air
1	100	Trucks and Tour.	St.	2	0	0	poor	0.20[2]
2	20	Trucks and Tour.	SS.RS.St.	1	0	0	poor	0.05
3	15	Tour.	St.SS.	2	4	1	fair	0.05
4	100	Trucks and Tour.	SS.RS.St.	3	0	0	poor	0.15
5	10	Tour. and Taxi	SS. St.	1	2	0	poor	0.05
6	5	Tour.	St.	2	1	0	fair	0.00
7	50	Tour.	SS.St	2	0	0	poor	0.10
8	12	Tour.	St.	1	0	0	poor	0.00
9	50	Tour.	SS.St.	2	2	0	fair	0.15
10	80	Tour.	St.	3	6	1	good	0.00
11	40	Tour.	St.	2	0	0	poor	0.00
12	25	Tour. and Taxi	SS.RS.St	1	0	0	poor	0.00
13	10	Tour.	St.	1	0	0	poor	0.10[3]
14	20	Tour.	SS.St.	1	1	0	poor	0.05
15	50	Tour.	SS.RS.St.	2	0	0	poor	0.10
16	15	Tour. and Taxi	SS.RS.St.	1	0	0	poor	0.15
17	70	Tour.	St.	2	4	2	good	0.00
18	25	Tour.	SS.St.	1	0	0	poor	0.15
19	50	Tour., Taxi, Truck	SS.RS.St.	2	0	0	poor	0.15
20	100	Tour.	SS.RS.	2	1	0	poor	0.10
21	30	Tour. and Trucks	SS.St.	3	2	0	fair	0.05
22	60	Tour.	St.	2	4	1	fair	0.05
23	30	Tour. and Taxi	SS.St.	1	0	0	poor	0.05
24	15	Tour.	SS.RS.St.	1	0	0	poor	0.10
25	25	Tour.	SS.RS.St.	2	0	0	poor	0.15
26	150	Tour.	St.	2	2	1	good	0.00
27	25	Tour.	SS.St.	1	0	0	poor	0.15
28	40	Tour.	SS.St.	1	0	0	poor	0.15
29	15	Tour.	SS.St.	2	1	0	fair	0.10
30	20	Tour.	SS.RS.St.	1	3	0	fair	0.15
31	20	Tour.	SS.St.	2	2	0	fair	0.10

[1]St. = Storage; SS. = Service Station; RS. = Repair Station.
[2]Inspected at 8 A. M.
[3]At the time of inspection, the engine of a car was being adjusted.

Table 2 is very instructive. In 77.5 per cent. of the garages inspected, carbon monoxide was present in the air in different concentrations. Ventilation was inadequate in all of them, even in the few which were well supplied with skylights and windows, since these were all kept tightly closed on account of the seasonal temperature. Not one of the

garages had a system of artificial ventilation. In the few garages for which the ventilation was recorded as "good" (see Table 2, Nos. 10, 17, and 26), the causal factor was probably the velocity of the wind on the day on which the inspection was made, which was recorded as 33 at the Park Station of the United States Weather Bureau.

The difference in the carbon monoxide content of the air of the garages inspected can be accounted for, in part, by the different kinds of fuel and mixtures of gasoline used. In the garages where repairs and adjustments of engines were made, the air conditions were invariably bad (see Table 2, Nos. 7, 15, 16, 19, 20, 24, 25, and 30). In the old garages, which are all remodeled livery stables, or barns, or old buildings, the danger is patent, whether they are used for storage or for other automobile purposes. Storage garage No. 1, Table 2, is an example. This was an old livery stable, of large dimensions, beneath a dwelling house, dark and damp and irregular in construction. At about 8 A. M. the carbon monoxide content of the air, in one of the many corners, reached 0.2 per cent., and the blood of the proprietor, who "had not been feeling quite well for a long time," showed a carboxyhemoglobin saturation of 18 per cent. This particular garage had been storing heavy trucks for the night and it was almost empty at the time of the inspection, but carbon monoxide, although lighter than air, rises slowly and does not oxidize to carbon dioxide spontaneously.

Recommendations

The remedies for the conditions discovered in this investigation are: (1) the application of the state laws; and (2) the general adoption of the ingenious suggestion of Dr. Henderson and Dr. Haggard of Yale University—the vertical exhaust for automobiles (8). The vertical exhaust certainly would simplify the problem of ventilation in all garages with skylights and would eliminate the expense of installing artificial ventilating systems. Exhaust gases from an automobile engine, if discharged vertically, would continue to rise, on account of their initial linear velocity and their temperature. Any opening in the ceiling of the garage would allow the carbon monoxide and other gases to escape before mixing to an appreciable degree with the air of the garage.

The application of a vertical exhaust to a car instead of a horizontal one does not offer any mechanical difficulty and it is not much more expensive, according to the opinion of mechanical engineers. The esthetic sense of the public would not suffer after the novelty had worn off. In closed cars the change in appearance would be slight. In fact, they would not seem unsightly with a vertical exhaust.

Every garage is potentially a workshop, although not visibly containing forges, benches, or any installation of machinery. The "tool kit" in every car and a few handy instruments are sufficient for making summary repairs, adjustments of engines and "running tests." The New York State Labor Law (9) under the definition of Factory (Article I, Section 2, Paragraph 9) includes: "workshops . . . where one or more persons are employed at manufacturing, including making, altering, repairing." Paragraphs 1, 2, and 3 of Section 299 state what the requirements should be in regard to the ventilation of every workroom in a factory.

The New York State Workmen's Compensation Law (10) in Article I, Sec-

tion 3, Paragraph 1: Hazardous Employments, states that "compensation shall be paid for injuries or death incurred by employees in the following employments," and under Group 14, work in garages is classified as a hazardous employment. The legislators probably intended to include in the term "injuries" only traumatic injuries of the most obvious tissues of the body; nevertheless carbon monoxide, through its interference with the oxygen-carrying function of the blood, causes a functional injury to one of the most important tissues of the body — an injury which may lead to a fatal result — and may therefore be included in the spirit of the law.

Conclusions

1. Exposure to automobile exhaust gases is a health hazard because of the carbon monoxide present in them.

2. The employees in the garages investigated for the purpose of this study showed a high percentage of carboxyhemoglobin. Failure to detect carbon monoxide in the air of a garage is not always an indication that no employee has carboxyhemoglobin.

3. There is a high carbon monoxide content in the air of garages where natural means of ventilation are depended upon. Legislation or code rules should require the installation of mechanical means of ventilation in garages in which repairs are made, and garages should be built according to plans drawn with special reference to proper disposal of exhaust gases from motors. The indiscriminate use of old stables, especially the type with living apartments above, should be prohibited.

4. Employees in garages should be warned of the danger from carbon monoxide and should be instructed in first-aid measures.

5. Chronic carbon monoxide poisoning should be made a compensable disease.

Bibliography

1. Facts and Figures of the Automobile Industry. National Automobile Chamber of Commerce, 1923.
2. Chilton Automobile Trade List, March, 1923.
3. Fourteenth Census of the United States. Population.
4. Sayers, R. R., and Yant, W. P.: The Tannic Acid Method for Quantitative Determination of Carbon Monoxide in the Blood. U. S. Pub. Health Rep., 1922, *37*, 2433.
5. Sayers, R. R., Yant, W. P., and Jones, G. W.: The Pyro-Tannic Acid Method for the Quantitative Determination of Carbon Monoxide in Blood and Air. U. S. Pub. Health Rep., 1923, *38*, 2311.
6. Henderson, Y., Haggard, H. W., Teague, M. C., Prince, A. L., and Wunderlich, R. M.: Physiological Effects of Automobile Exhaust Gas and Standards of Ventilation for Brief Exposures. This Jour., 1921-1922, *3*, 79.
7. Rosenau, M. J.: Preventive Medicine and Hygiene. New York and London, D. Appleton and Company, 1916.
8. Henderson, Y., and Haggard, H. W.: Health Hazard from Automobile Exhaust Gas in City Streets, Garages and Repair Shops. The Vertical Exhaust as a Practical Measure of Amelioration. Jour. Am. Med. Assn., 1923, *81*, 385.
9. New York State Labor Law with Amendments, Additions and Annotations to Aug. 1, 1923.
10. New York State Workmen's Compensation Law with Amendments, Additions and Annotations to Aug. 1, 1923.
11. Dublin, L. I.: Occupation Hazards and Diagnostic Signs. U. S. Bur. Labor Statis., Bull. 306, April, 1922.
12. Kinnicut, L. P., and Sanford, G. R.: The Iodometric Determination of Small Quantities of Carbon Monoxide. Jour. Am. Chem. Soc., 1900, *22*, 14.
13. Sayers, R. R., Yant, W. P., and Jones, G. W.: The Pyro Tannic Acid Method for the Quan-

titative Determination of Carbon Monoxide in Blood and Air. U. S. Bur. Mines, Rep. Investigations, Ser. No. 2486, June, 1923.

14. The M-S-A Carbon Monoxide Detector. Mine Safety Appliances Company, Pittsburgh, Pa., Bull. 60.
15. Haldane, J. S.: Methods of Air Analysis. London, Charles Griffin and Company, Ltd., 1920.
16. Mead, A.: Modern Gas Work Practice. London, Benn Brothers, 1921.
17. Fieldner, A. C., and Jones, G. W.: The Sampling and Analysis of Automobile Exhaust Gas. Reprint from Jour. Franklin Inst., Nov., 1922.
18. Haldane, J. S., and Priestley, J. G.: The Regulation of the Lung-Ventilation. Jour. Physiol., 1905, *32*, 225.
19. Haldane, J. S.: Respiration. New Haven, Yale University Press, 1922.
20. Haggard, H. W., and Henderson, Y.: The Treatment of Carbon Monoxid Poisoning. Jour. Am. Med. Assn., 1921, 77, 1065.

HEALTH SUPERVISION OF EMPLOYEES IN FINANCIAL ORGANIZATIONS*

MORRIS H. KAHN, M.A., M.D.
140 West 69th Street, New York City

IT is with the hope of stimulating the interest of banks and similar clerical organizations in the health phase of their business that this report of the work of the medical department of a large banking and loan organization is presented. The department was established for an experimental period of six months but was continued as a permanent institution.

It was my desire to create among the employees an interest in their health. In the beginning, brief talks were given on the functions of the department, diet, and hygiene. It was found later that it was easier to convey the principles of sound personal hygiene to their minds by giving to each individual a great deal of time for discussion and advice at the close of the physical examination.

Much time and attention have been devoted to individual physical examinations. Thorough medical examinations have been made of all the employees of the organization and of all new applicants for employment, in order to exclude infectious or communicable diseases or any conditions which might incapacitate the individual for long or frequent periods during his service or might have a depreciating effect upon his efficiency.

The total number of persons examined was 178. The following table classifies them according to age and sex.

Age Group	*Males*	*Females*
Under 21	18	3
21-30	92	7
31-40	31	3
41-50	13	1
Over 50	10	0
	164	14

Of this number, two were found to be over weight to a degree which was a hindrance to health and comfort, and a larger number were considerably under weight.

In this study of the state of health of employees, it was felt that it was within the scope of communal medical supervision to enter into the details of their sexual hygiene. It is doubtless true that the accuracy and correctness of such a study depends in great part upon the veracity of the persons questioned. In this instance, it seems to me fair to assume that the data revealed are representative of conditions among the more or less intelligent class from which these employees were drawn.

Thirty of the male employees stated that they had had venereal disease. The age distribution of these employees is as follows:

Age Group	*No. of Employees*	*% of Total of Same Age*
Under 21	0	0.0
21-30	7	7.5
31-40	10	32.2
41-50	8	61.5
Over 50	5	50.0

From these figures, it appears that under present standards people become

*Received for publication March 31, 1924.

affected by venereal disease in greater proportion as they grow older. This subject was specially discussed at the time of the medical examination, particularly with the younger men. I attempted to destroy some of the fallacies and superstitions on the subject of sex in the minds of the younger men and to present sex problems on a rational basis.

Data regarding the excessive use of alcohol which are based only upon the statements of employees are unreliable. Therefore, I endeavored to corroborate their statements by physical examination. Indulgence in harmful habits was considered in its relation to stability of character and good health. The following table shows to what extent alcohol and tobacco figured as habits:

	No. of Employees Using			Non-Users
	Excessively	Moderately	Slightly	
Tobacco	10	69	26	59
Alcohol	2	21	47	94

Regarding the alcohol problem, we must admit the experimental scientific proof of the effects of alcohol, even in small doses, on physical strength and on mental processes. Progressive deterioration of the body tissues and of the physiological functions takes place with the continued use of alcohol. The frequent use of it tends to the formation of a desire and a habit. Statistics show that the use of alcohol is a distinct detriment to longevity and that total abstainers are longer-lived than non-abstainers and have a mortality from 10 to 30 per cent. lower. For these reasons it seems to be scientifically correct to oppose indulgence in alcoholic beverages and to urge complete abstinence among employees.

The examination of the eyes showed defects of vision in fifty-six employees. Of this number, thirty-five had had their eyes examined and the sight corrected, but twenty-one were not cognizant of their defects. Two employees showed a contagious granulation of the lids.

There was a striking number of ear defects, totaling thirty. Hearing was very appreciably diminished in fifteen cases. In several of these the watch could not be heard even when applied directly to the ear. In addition, accumulations of wax in the ears of twenty-three employees required removal.

Nasal defects, consisting chiefly of various forms of obstruction, existed in eighteen cases.

The problem of the teeth and pyorrhea was managed with ease and only a few of the employees needed extensive dental care.

Enlarged tonsils were the cause of occasional illness in eighteen employees. In a few of these, this appeared to be the only important physical defect.

Heart disease of varying degrees of severity and significance was found in eight cases. It is certain that the efficiency of an individual with heart disease, all other things being equal, is less than that of a normal individual.

Arteriosclerosis and high blood pressure existed in fourteen cases.

Pulmonary tuberculosis was discovered in one case. Of course, the existence of this disease necessarily excludes an applicant from employment. Only periodic physical examination of all employees every six months could reveal the earliest sign of tuberculosis and prevent its active spreading. It is hoped that tuberculosis will disappear when periodic physical examinations are universally instituted.

There were five other cases of respiratory ailment such as chronic bronchitis and emphysema. Each of these

patients received appropriate advice and treatment.

There were in the employ of the organization six individuals with hernia. Ten other persons had weak inguinal rings which predispose to the formation of hernia.

Twenty-three persons had skin troubles. The conditions found may be classified as follows:

Disease	*No. of Cases*
Acne	9
Pityriasis	4
Psoriasis	3
Eczema	7

Flatfoot existed in seven cases, and postural and other orthopedic defects were also encountered.

The nervous system was abnormal in twenty-three individuals, as a result either of high tension work or of temperament, abnormal sex life, or alcoholism. One person had epilepsy.

Four persons had syphilis according to blood examination. The blood examination of one showed that he had sufficient treatment; the periodic physical examination would indicate the need of any further treatment. The blood of two others showed that they still required treatment.

A slight albuminuria revealed defects of the kidneys in four cases.

The blood of a number of employees showed a slight degree of anemia.

By an analysis of these examinations a great deal is revealed. Semi-annual physical examinations are a necessity where a large number of people are employed, and are a mark of the efficiency of the organization.

MENTAL HYGIENE IN INDUSTRY*

Henry B. Elkind, M.D.

The Mental Hygienist and the Personnel Worker

THE problems of personnel administration are virtually problems of mental hygiene. Personnel administration deals fundamentally with man, and so does mental hygiene. The difference in terms is due to the industrial setting of the former. This difference is obliterated in the expression, "Mental Hygiene in Industry." In practice there are minor differences, not in kind but in degree. The personnel worker deals, it is true, with the human being, but in a more or less formal manner. The mental hygienist's study of human nature is deeper and basically more sound. His viewpoint is not constricted by conventional thinking. He is willing to accept the facts brought to light by studies in abnormal psychology and psychopathology. He tends to integrate his knowledge by drawing upon all sciences for facts which may help solve his everyday problems. In his work he finds it necessary to use facts and technic gained from such sciences or arts as medicine, psychiatry, psychology, social psychology, sociology, and economics. If, as is usually the case, he is a physician, he has been fortunate enough to have had a broad acquaintance with these sciences and arts. He may, perhaps, be wanting in some of the more truly industrial methods of attack which are being employed today, but he is rapidly coming in contact with these, accepting some *in toto*, modifying others, and discarding the rest.

The worker in personnel administration, on the other hand, generally is a person who has been picked from the ranks. He has been very successful as an executive and has been found unusually gifted in the handling of men. He has moved chiefly in industrial circles and is forced to do the best he can with the knowledge and tools which he happens to have. Of late years a new type of personnel worker has been evolved—the college graduate who has taken special courses in personnel work. His training, like that of the previously mentioned type of personnel worker, is chiefly along industrial or mercantile lines. Psychology and the methods of mental hygiene are incidental items in the curriculum. His knowledge of human nature, however, is somewhat broader than that of the personnel worker who has had no special education and whose experience has been gained chiefly in industry.

The aims of both the mental hygienist and the personnel worker tend in the same direction—the adjustment of man, the employee, to his industrial environment; they differ mainly in the amount of emphasis placed upon the use of a fundamental knowledge of man. It is probable that the future will see the personnel worker in industry placing more and more weight upon a scientific knowledge of the employee as a human being. He will depend more upon scientific procedure to obtain his facts and less upon arbitrary judgment. He will use scientific methods of solution and attack wherever and whenever available. He will be constantly investigating in order to determine new facts. His ex-

*Received for publication April 9, 1924.

periments will show some effort at control and he will then begin to feel more confidence in his results. He will use empirical methods, fully realizing that he is doing so but ever anxious to supplant them with scientifically evolved procedure as soon as practicable. It must be granted, however, that this ideal will never be completely realized, but it is proper and fitting that attempts in this direction should ever be continued.

Personnel administration concerns itself with numerous functions, the most important of which are employment, placement, vocational guidance and selection, welfare, health and safety work, and the like. In all of these it is patent that the employee is one of the main considerations. In the working out of these functions up to the present time empirical methods, for the most part, have been utilized. In a few industries and mercantile establishments attempts have been made to determine some of these functions scientifically and to develop methods of approach based on fact, not on tradition or custom; on scientific procedure and logical reasoning, not on arbitrary judgment. In placement and employment there have been numerous attempts to change from the old to the newer conception. Mental tests, technical questionnaires, and trade tests have been evolved. Rating scales and control methods have been devised. In health and welfare work there has been considerable progress. Industrial medicine and hygiene are gradually gaining in momentum and are becoming more popular with both employer and employee. We see attempts at educating the employee in the development of educational programs. These activities are the result of more or less sporadic efforts to solve the question of the proper adjustment of man to his industrial environment, and are not the result of any definite program. One reason for this is that scientifically controlled experiments in industry have not yet had sufficient opportunity to prove just what is necessary and what are the best methods of attacking the problem. Along physical lines much more of value has been done; along psychological lines much is still in dispute.

Intelligence Tests and Rating Scales in Industry

It will take some years before a definite program is worked out that will prove economically and scientifically sound for industry. As a contribution to this end certain studies have been organized in one of the large mercantile establishments in the city of Boston. This paper presents the results of a study of what is called the Junior Personnel. These number, on the average, about 150 and their ages range from 15 to 24. The majority of the girls are from 17 to 19 years of age. They are employed as cashiers, messengers, stock girls, markers, receivers, stenographers, and clerks. A separate personnel worker is in charge and supervises the activities during working hours; she is known as the Supervisor of Junior Personnel. It was fortunate that this group could be studied in both the health and the employment departments, making it possible for the problem of personnel adjustment to be viewed from different angles.

The opportunity to give a group psychological test to the junior personnel came during December and early January. Because of the holiday season and of the impossibility of securing all the employees at once for these examinations, it was necessary to divide them into three groups. It was impossible

to arrange for all to take them. The examination given was the Otis General Intelligence Examination. This was selected chiefly because of its self-administering feature, which makes it very desirable for industrial purposes. It consists of seventy-five questions of varying degrees of difficulty. Credit is given for speed, but accuracy is considered more important. The results of this test have been analyzed and the following data have been derived.

One hundred and thirty-three junior employees (females only) were given the examination. These employees may be divided into two groups: (1) clerical employees, and (2) non-clerical employees. The median score for the first group was 44.5, with a semi-interquartile range of 6. The second group gave a median score of 30.9, with a semi-interquartile range of 8.2. It is quite evident from these scores that there is some positive association between native intelligence and clerical ability. The percentile grades for each group are given in Table 1.

The trend of these results seems to indicate that a higher grade of intelligence is found in the clerical than in the non-clerical employees of this store. This fact is also proved by experience. The majority of the girls now working as clerical workers are relatively a highly selected group. They were previously employed in the store in other capacities and, being found satisfactory, were promoted and trained for clerical work. A few are high school graduates with commercial training or are graduates of business schools. Another interesting fact brought out by this test is that the highest marks (over 55) were secured in all cases by individuals who were considered to be among the best employees. They had had better opportunities for education than the majority. But the inverse was not true. Some of those who secured the lowest marks (below 20) proved to be highly satisfactory in their positions. Investigation showed that some of these were high-grade morons (by Stanford-Binet) but that the work that they were doing did not require an average amount of intelligence. With one exception, they were not clerical workers; the majority were employed as stock girls.

TABLE 1.—RESULTS OF PSYCHOLOGICAL TEST OF JUNIOR EMPLOYEES[1]

Clerical Employees											
Score	12	20	21	27	32	33	37	38	39	40	41
Percentile Rank	2.0	4.5	6.5	11.0	18.0	22.5	24.5	27.0	29.5	32.0	34.5
Score	42	43	44	45	46	47	48	49	50	53	56
Percentile Rank	43.0	45.5	48.0	52.0	59.0	63.5	72.5	75.0	77.5	80.0	86.0
Score	57	61	62	63	65	70	Median Score 44.5				
Percentile Rank	88.5	91.0	93.5	95.5	97.5	100.0	Semi-interquartile Range 6.0				
Non-Clerical Employees											
Score	5	6	9	15	18	19	20	22	23	24	25
Percentile Rank	1.0	2.0	3.0	5.5	7.5	11.0	12.0	14.5	19.0	21.0	29.0
Score	26	27	28	29	30	31	32	33	34	35	36
Percentile Rank	30.0	33.5	39.0	42.5	43.5	50.5	52.5	54.0	58.0	59.0	61.0
Score	37	38	39	40	41	42	43	45	47	48	49
Percentile Rank	62.5	65.0	70.5	73.0	76.0	78.0	83.0	84.0	85.0	88.5	89.5
Score	50	51	52	54	55	61	62	67	Median Score 30.9		
Percentile Rank	91.0	92.0	93.0	95.5	96.5	97.5	98.5	100.0	Semi-interquartile Range 8.2		

[1] Otis General Intelligence Examination.

It is interesting to note that a junior employee receiving the score of 9 and the Stanford-Binet intelligence quotient of 65 was considered by her immediate superiors as being very efficient. Further investigation showed that this girl, when first employed, had found it difficult to satisfy the requirements of these same superiors. The educational director, apprised of this, had fortunately recognized the fact that the girl did not possess average intelligence and had made a special effort to adjust her to her job. After a few weeks her work became very satisfactory and she is now considered one of the best of the junior employees. It is, of course, true that she possesses personality traits that make up for her lack of intelligence. She is pleasant, willing, honest, co-operative, industrious, and neat, certainly qualities necessary for efficiency and success in jobs such as that of stock girl, or, in fact, any job. This case indicates that though there are maximum and minimum levels of intelligence for each job, personality traits other than intelligence are always of great importance and have to be considered in problems of vocational guidance and selection. It also illustrates the necessity of the recognition of the high-grade moron in adjusting the employee to the job. If it had not been for the keen insight of the educational director, who has had many years of training as a public school teacher, this girl would have been discharged and she would have appeared on the labor turnover ledger as unsatisfactory, or she might have left of her own account and it would have been recorded as a case of voluntarily leaving because of dissatisfaction. In this instance a little attention to detail, a little extra patience, and a deeper understanding of the human problem salvaged the girl and now she is a fit, satisfactory, and self-supporting member of her industrial unit.

While these tests were being given and some of the above observations were being made, a rating system for the junior personnel was installed. The scale used was somewhat similar to Scott's Graphic Rating Scale for Non-Executive Employees but the graphic and some other features were not retained. A copy of the form is given in Figure 1. These sheets of paper were given out each month to the floor managers and department executives, who saw to it that each junior employee was rated by at least two executives wherever possible. In this particular store it was difficult to have all the employees rated by two executives and we have had to be satisfied in many cases with the ratings of one. When these sheets were all turned in, the ratings were copied on to a special card adapted for the purpose; attendance and tardiness were also included on this card. About

FIGURE 1

REPORT ON JUNIORS

Name ..... Date .....
Position .....
Dept. Head .....
Dept. .....

RATINGS FOR PAST MONTH

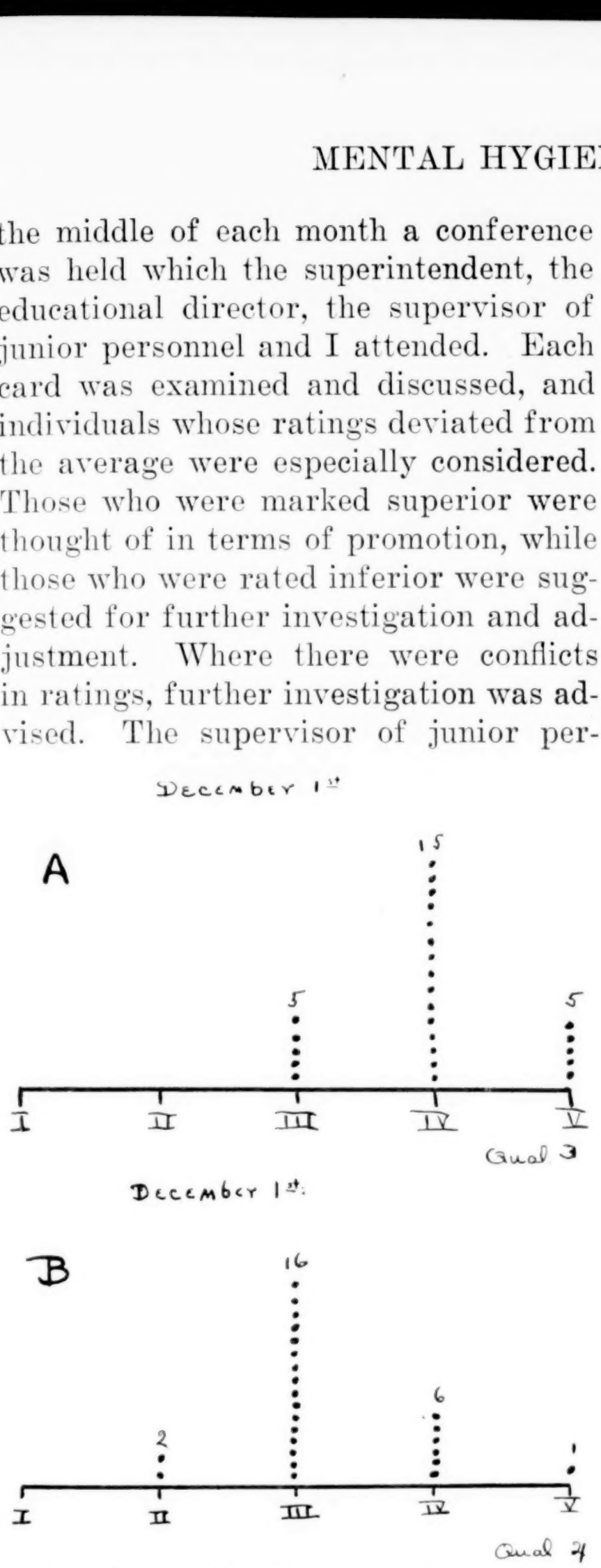
1 Ability to learn .....
2 Quantity of work—Speed .....
3 Quality of work .....
4 Industry .....
5 Initiative .....
6 Co-operativeness .....
7 Knowledge of work .....
8 Appearance .....
9 General Health .....

GENERAL REMARKS AND SUGGESTIONS

NOTE—Fill out above report correctly using code

V Superior IV Above average III Average
II Under average I Poor

the middle of each month a conference was held which the superintendent, the educational director, the supervisor of junior personnel and I attended. Each card was examined and discussed, and individuals whose ratings deviated from the average were especially considered. Those who were marked superior were thought of in terms of promotion, while those who were rated inferior were suggested for further investigation and adjustment. Where there were conflicts in ratings, further investigation was advised. The supervisor of junior personnel acknowledged, after one or two of these conferences, that this method proved a great help to her in her work; it brought her into closer touch with the minor executives and with the individual employees. This system is still in effect.



FIGS. 2A AND 2B.—Showing method of entering ratings of each rater.

After three months of trial, the results were analyzed statistically in the following manner:

1. The ratings for each quality were considered separately for each month. On separate cards were entered the ratings of each rater so that one could judge the individual tendencies of the raters in rating their employees. (See Figs. 2A and 2B.)

2. The ratings for each quality were again considered separately for each month but not in relation to the raters. In this case the number of employees receiving each of the ratings required was determined for each month. (See Table 2.)

Only a few raters had more than three or four employees to pass judgment upon. This made it impossible to secure adequate distributions of ratings in all cases. In the samples examined, there appeared a tendency not to rate anyone "poor" (I) and a shifting tendency to use "average" (III) and "above average" (IV) as norms. This shifting of norms was also observed in the second analysis. For instance, in the month of December qualities 1, 3, and 6 find their modes at IV (above average), while qualities 2, 4, 5, 8, and 9 find their modes at III (average). The same phenomenon may be seen in January and February although the qualities are not in exactly the same order of sequence. Weighting here is quite impracticable and untrustworthy for statistical inference. It was originally intended to use these ratings for correlation with the test scores secured in the group psychological test, but this has not been done because of the difficulties and uncertainties described above.

Experience with this rating system, however, indicates that it is a valuable personnel instrument, that it tends to keep employees and executives in close touch with the employment department, and also that it keeps the question of

TABLE 2.—ANALYSIS OF RATINGS FOR THREE MONTHS [1]

QUALITY	NO. OF EMPLOYEES RATED					NO. OF EMPLOYEES NOT RATED
	I	II	III	IV	V	
December (103 Employees)						
1.—Ability to learn	0	0	34	11	28	0
2.—Quantity of work	0	2	44	33	24	0
3.—Quality of work	0	2	34	43	21	0
4.—Industry	0	4	40	36	21	2
5.—Initiative	0	6	52	30	15	0
6.—Co-operativeness	0	1	27	44	31	0
7.—Knowledge of work	0	1	37	37	28	0
8.—Appearance	0	3	51	24	24	1
9.—General health	0	4	48	22	22	7
	0	23	367	310	217	10
January (101 Employees)						
1.—Ability to learn	0	0	33	45	23	0
2.—Quantity of work	0	0	31	41	29	0
3.—Quality of work	0	1	25	46	29	0
4.—Industry	0	3	36	36	26	0
5.—Initiative	0	5	42	30	24	0
6.—Co-operativeness	0	1	24	41	35	0
7.—Knowledge of work	0	1	22	49	29	0
8.—Appearance	0	4	37	31	26	3
9.—General health	0	4	51	17	26	3
	0	19	301	336	247	6
February (85 Employees)						
1.—Ability to learn	0	1	20	51	12	1
2.—Quantity of work	0	1	26	40	16	2
3.—Quality of work	0	1	23	41	18	2
4.—Industry	0	2	30	41	10	2
5.—Initiative	0	2	36	33	12	2
6.—Co-operativeness	0	1	23	35	24	2
7.—Knowledge of work	0	0	25	40	18	2
8.—Appearance	0	0	36	32	15	2
9.—General health	0	0	43	20	19	3
	0	8	262	333	141	18

[1] A table showing the ratings of those who were rated a second time in each monta is not included as the principle involved is sufficiently illustrated in the above table.

personality more or less alive in the minds of all executives. One change, however, could profitably be made—namely, substitution of the three classes, "poor," "average," and "good" for the five now used. This would coincide with the natural tendency of practically all the raters to divide their employees into three groups.

Experience with this rating system also brought out the fact that very close supervision is necessary. There is always more or less tendency to shift norms for each quality. There is also an inclination for prejudice to creep into the giving of ratings. For these reasons it does not seem, except under the most unusual circumstances, that ratings can be used to develop a correlation with intelligence test scores. Under special circumstances, however, this may perhaps be done successfully. The minimum conditions to observe are that the group studied number at least fifty or sixty employees and that they be capable of close supervision; that the number of raters be three or more and that they be in close touch with all of the group studied. Under these conditions only can ratings of employees in industry be honestly correlated with intelligence test scores. Under usual industrial conditions so many factors enter into ratings that they do not become

reliable criteria to use. Intelligence test scores themselves are not infallible, but if well standardized they are fairly reliable.

While these studies were being carried out, the routine procedure practised in the employment department was observed. In fact, many girls were interviewed by me for employment and many were referred to me when the question of transfer or discharge had been raised. Here was an excellent opportunity to judge of the possibility of using the general principles of mental hygiene in such work, and as a result of this study the conclusion has been arrived at that it is in the employment department that the greatest amount of good can be realized, and that there is great need for the utilization of mental hygiene in its work. Individuals come for employment; their acceptance and their placement is a matter of adjustment; so also, when employees are transferred or suggested for discharge, the matter is one of adjustment to environment or situation. For the solution of these problems, there is need of all the knowledge and technic that mental hygiene in industry has now to offer. Practically each case that comes up presents a problem all its own. It is necessary to know the physical, mental, and social sides in order to give a just and practical answer. It should be the aim of those who make these adjustments to be of service to the employee, to the firm and to society in general, and it is by utilizing the principles of mental hygiene that this can be done with the greatest amount of efficiency.

At the present time employment procedure is for the most part by rule of thumb and is oftentimes determined by the mood or whim of the employment executive; there are no dependable standards to follow. Very little is known about the job which the employee is expected to fill, or about the employee who is to fill the job. Consequently the result is really left to chance. During the working period of the employee there are, of course, many opportunities for various types of adjustments. Here, again, there is no rule nor standard. One rule applies at one time, and another at another. To illustrate a few of the problems encountered and how application of the general principles of mental hygiene has solved them satisfactorily, two cases are cited.

Case 1.—B. M. This bright-appearing young lady of 19 was referred to me as being dissatisfied with her work and desiring a change of job—a desire which could not be satisfied at that time. Leaving the organization was the next step, and she was sent to me for solution of her problem. She had been employed for six months in the auditing office, and her job consisted in checking and filing duplicate sales slips. After some time she noticed that she was not being treated fairly by her forelady, that she was being "picked on" and reprimanded without cause. She believed that she was doing her work as well as the majority. This made her nervous and somewhat dissatisfied. Some time later she began to feel that her fellow workers also were not treating her the way they should, that they were conspiring to injure her with a view to causing her to lose her job. She stated that she was becoming more nervous and dissatisfied. Questioning brought out the fact that her widowed mother had been ill for several months, that she was the only means of support, that a sister, aged 21, who was able to work had been unable to find a job, and that she herself would not take any other work in the store except an office position. She felt that work as a stock girl would be a demotion to her and she considered it a sort of disgrace. (This form of class prejudice is quite common and is not peculiar to this girl.)

It did not take very long to see what was the prime demoralizing factor in this girl's case. She was suffering from congenital left internal strabismus, which certainly made it difficult for her

to use her eyes for fine reading. Her difficulties were interpreted to her in the following conversation: "You have had to use your defective vision in a job where good eyesight is essential. The light is not always good where you are working, and very often it is hard to decipher what is written on duplicate sales slips. This has made it difficult for you to do your work. Your forelady has tried to help you, but you could not see that this was necessary. You were trying very hard to do your best. You are naturally bright and you could not see why you could not do your work efficiently. This made you nervous and made you lose your balance concerning what was happening about you. You unjustly began to suspect your forelady of being too severe with you and, what is more unusual, to suspect your fellow workers of treating you unfairly and of conspiring against you. In my opinion these suspicions were due to a nervous state of mind and were aggravated by the fact that you knew you had to work. Your sister could not obtain a position and you could not think for a moment of giving up this job which was so unpleasant to you. You would not take another position in this store where you would not have to use your eyes, for you felt that it was a disgraceful thing to do. I do not say that you thought all these things out as I have mentioned them to you, but this is how I believe you came to feel as you do. Now you must recognize the fact that you have a physical defect, your defective vision, and that it cannot be remedied. You have told me that your own doctor, who is an eye specialist, told you this. The proper thing for you to do is to accept a position which you can fill efficiently and satisfactorily, and which is available, which will not put any strain on your eyes, and this is a position as stock girl. You must try to live down your prejudice against it, for you are unreasonable to feel the way you do about it. The truth of the matter is that a stock girl's job is nothing but an apprenticeship to a sales position. In department stores, where you like to work, salespeople receive the better salaries and there are opportunities for promotion to assistant buyer or buyer. The salary possibilities are much greater in the case of salespeople than in the case of office people."

As a result of this conversation the girl accepted a position as stock girl. After a few weeks, the superintendent stated that she was doing excellent work. A week or so later it was reported that she had some paranoid ideas concerning me. She felt that I was trying to make her lose her job. She was interviewed again and the reasons for her transfer were explained in detail. She stated that she had not fully reconciled herself to being a stock girl. This was gone into at length, and she was told that the superintendent felt very much pleased with her work. This interview, with the encouragement offered, seemed to brighten up the girl's countenance, and she went away promising to leave her prejudices in the matter behind her. The reports about her work and about her attitude following this interview were excellent. A month later she temporarily left the store for an operation on her eye, and at the present time she is anxiously waiting to regain her strength to go back, not as a clerical worker but as a stock girl. Furthermore, she has seen to it that her sister is working for the same company.

This case illustrates how the application of the principles of mental hygiene brings about a more efficient adjustment of the employee to his job and makes for salvage and for a cutting down of labor

turnover. There is one less in the army of the dissatisfied. Another possibility has been avoided. This girl might have, in a short time, developed a true psychosis. Let us suppose that she had been allowed to leave the organization and that she had applied for work at another department store. She undoubtedly would have applied for clerical work again. The same train of symptoms would have followed with exaggeration. Let us imagine that this cycle of events occurred a few times. It is probable that mental disease would have been the result. A paranoid personality, paranoia or dementia praecox paranoid may be conceived as possible end-results.

The next case cited is an example of how a well-balanced routine physical examination brings to light a serious mental disturbance.

CASE 2.—B. D. This girl, aged 17, is very efficient, bright, and quick to learn. She has been rapidly promoted to a higher type of work than the average stock girl does. Physical examination brought out nothing important, but inquiry into her emotional life elicited the fact that she had become interested in a young man. She had begun seriously to like him and her grandmother approved of this, but her mother severely reproved her for going with the boy. Consequently, she kept company clandestinely. The fact that she was doing so troubled her considerably, and she had not been able to sleep for over two weeks. She also stated that she had developed feelings of love and hate toward the fellow. She looked wretched, and investigation showed that she was not doing her work as well as usual. Further questioning disclosed that she was possessed of the more or less introvert type of mind and that she found it hard to adjust herself to new conditions. She had been feeling very nervous for several months. She was referred to the superintendent with the suggestion that she be sent to me again or to some other physician for special treatment.

Here is a case that certainly needs the adjustment which mental hygiene offers. The amount of emotional stress that this employee is going through is not necessary. The girl did not have proper home training when a child and adjustment is generally quite difficult for her. Her parents probably do not understand the meaning of the emotional life of a girl during the period of adolescence. This is another illustration of the necessity of determining the physical, social and mental factors in a case before attempting therapy. In this case a talk with the mother was suggested.

INCIDENCE OF FUNCTIONAL NERVOUS DISEASE

The investigations have not continued to the stage where it is possible to demonstrate the extent of mental deviations from normal among working people. Some work along this line has been done in a large department store in the city of Boston, the Jordan Marsh Company, by Dr. H. W. Stevens, Director of the Health Department. Analyzing the cases of illness occurring during a period of six months, he found that, out of a group of 4,000 employees, 405 manifested disability from functional nervous disease. This makes a case incidence of about 10 per cent. From this cause alone, 1,546 days of working time were lost by 123 individuals, making 9.2 per cent. of the total time lost through illness by the employees of the store. "Nervous System, Functional" stood fourth in the order of frequency among the complaints treated in the store health dispensary.

Through the kindness of Dr. C. O. Sappington of the Department of Vital Statistics of the Harvard School of Public Health, I have been given some data on the incidence of functional nervous disease in employees of a large public utility. Analyzing the medical records

for five years, he was able to derive the following rates:

FUNCTIONAL NERVOUS DISEASE BY OCCUPATION AND DEPARTMENT

	Rate per 100 Persons in Occupation
Stenographers (mainly female)	16
Clerks	10
Meter testers	10
Firemen	7
Telephone operators (female)	4
All occupations	6

Seven hundred and thirty-one cases of functional disease of the nervous system were reported in five years; from this cause alone 6,882 working days were lost. The average number of working days lost per year per case was 9.4. Functional nervous disease happens to be one of the important causes of sick absenteeism in this company; it is fourth in number of cases and fifth as to rates.

The total amount of benefits paid for five years by the company for all diseases was $139,872.40, out of which $19,923.20 was paid to persons suffering from functional nervous disease. This amount is much greater than the amounts paid out for rheumatism, arthritis, and gout, and for the common cold added together. The average case cost for functional nervous disease was $27.20, the highest case cost among all the various diseases met with. In comparison each case of common cold cost the company 92 cents.

From these figures one can fairly estimate the extent and magnitude of the problem. The first set indicates conditions as found in a large department store; the second, the state of affairs in a large public utility. In the department store the employees are mainly women, while in the public utility the employees are mainly (approximately 80 per cent.) men. These figures are not quoted to give the impression that the diagnoses tabulated were correct in all cases but any error seems to be overbalanced by the fact that very often cases diagnosed as organic complaints are found to be functional nervous disorders. For this reason it may be safely inferred that the case incidence of functional nervous disease is not lower than the figures mentioned above.

SUMMARY

The expression, "Mental Hygiene in Industry," may be used synonymously with "Personnel Administration." Both deal with man as their main problem. The tendency of the times is to delve deep into the facts of human nature and apply them to the everyday adjustments that come up in industry.

During a recent investigation in a large mercantile establishment in the city of Boston, it was my good fortune to observe actual conditions as they occurred day in and day out. A few of these experiences are described in this paper.

A group psychological test (The Otis General Intelligence Examination) was given to determine whether there was any correlation between general intelligence test scores and performance as measured by ratings by immediate superiors. The results indicate that there is some positive association between native intelligence and clerical ability. It was found undesirable to develop a correlation between the scores from the group test and the ratings by the executives. It was also ascertained that while high scores were regularly obtained by those considered very efficient, the inverse of this was not always found true. A case is cited illustrating this point. A girl obtaining a very low score in the group test and a score suggesting

high-grade feeblemindedness (by Stanford-Binet) was considered an excellent employee. An interesting point brought out was that this individual found it difficult in the beginning to make good, but that intelligent adjustment had resulted in her being considered very efficient. These results suggest that though there are minimum and maximum levels of intelligence for each job, personality traits are of great importance and must be considered in problems of vocational guidance and selection.

Two cases are given in some detail illustrating how necessary it is to elicit physical, mental, and social factors in cases of industrial maladjustment. In the first case, a physical cause was the chief precipitating factor; in the second, emotional and social causes were at the bottom of a serious mental conflict.

Statistics are given to indicate the seriousness and extent of functional nervous disease among working people. Statistics from two large industrial groups are given, the first having a preponderance of female employees and the second, of male employees. Both series indicate that functional nervous disease has a high case incidence, and that it is a leading factor in the loss of working days and in the cost of sick benefits.

BIBLIOGRAPHY

1. Scott, W. D., and Clothier, R. C.: Personnel Management. New York, A. W. Shaw Company, 1923.
2. Stevens, H. W.: The Psychic Aspect of Industrial Disability. Bull. Mass. Dept. Ment. Dis., Jan., 1923.
3. Otis, A. S.: Otis General Intelligence Examination. Yonkers, N. Y., World Book Company, 1920.

BOOKS RECEIVED

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

FIGHTING FOES TOO SMALL TO SEE. By *Joseph McFarland*, M.D., Sc.D., Professor of Pathology in the Medical Department of the University of Pennsylvania. Cloth. Pp. 309 with preface, introduction, and index. Philadelphia: F. A. Davis Company, 1924.

PRACTICAL ELECTROTHERAPEUTICS AND DIATHERMY. By *G. Betton Massey*, M.D., Fellow and Former President American Electrotherapeutic Association; Member Philadelphia Obstetrical Society; Former Surgeon to the American Oncologic Hospital; Former Gynecologist to Howard Hospital; Former Electrotherapeutist to the Philadelphia Orthopaedic Hospital and Infirmary for Nervous Diseases; Former Assistant Physician to the Danville State Hospital for the Insane; Author of "Electricity in the Diseases of Women"; "Conservative Gynecology and Electrotherapeutics"; and "Ionic Surgery in the Treatment of Cancer." Cloth. Pp. 394 and index. New York: The Macmillan Company, 1924.

BOOK REVIEW

PUBLIC HEALTH IN THE UNITED STATES: AN OUTLINE WITH STATISTICAL DATA. By *Harry H. Moore.* Cloth. Pp. 436 and preface, introduction, appendices, notes, and index. New York and London: Harper and Brothers, 1923.

This new book is the second volume in Harper's Public Health Series and is edited by Dr. Allan J. McLaughlin. As is stated in the author's preface, it is an attempt "to bring together in compact form the more important statistical data and other facts regarding the principal aspects of the nation's health." The author acknowledges considerable assistance from Edgar S. Sydenstricker of the United States Public Health Service and has had all the statistical data carefully checked by Selwyn D. Collins and Rollo H. Britten, who are statisticians attached to the United States Public Health Service. The book is certainly conceived under excellent auspices, many of our country's famous public health experts having assisted in various ways.

Reviewing the contents of the book, one is impressed by the novel arrangement of the material and data. For instance, the author devotes a part of his book to "The Warfare against Disease" and discusses this subject under the following headings:

1. The Conquests of Science
2. Unconquered Enemies
3. Enemies Not Yet Attacked

Among the Conquests of Science, he includes smallpox, yellow fever, and typhoid fever in particular; among the Unconquered Enemies of Man, tuberculosis, venereal disease, children's diseases, mental disease, cancer, malaria, hookworm and the industrial diseases; among the Enemies Not Yet Attacked, pneumonia and influenza, the degenerative diseases of the heart and kidneys, drug addiction, pellagra, diabetes, the common cold, hay fever, asthma, and constipation. There are interesting chapters on nostrums and on the school as a super-health organization, and many others, too numerous to mention in detail.

The style is fascinating and interesting, and one feels impelled to finish the book after having read a few pages. It can be recommended highly for the use of the layman, the general practitioner of medicine, and the public health specialist as well. There is a mass of material that may be considered fairly authentic.

On account of the fact that the author stresses the statistical treatment of the subject, it is probably worth while to review this matter in some detail. One finds that the statistical inferences derived follow more or less the thought of the majority of health workers of the present day. The author, however, is more cautious than many. He properly is wary of the use of gross or general rates for deriving statistical inferences. He prefers the use of specific rates and leans toward analysis by age, sex, and other distributions. An example of one of the pitfalls in statistics that the author, like others, has fallen into is the feeling that the average duration of life for the United States is possible of further prolongation. He gives the death rate for the United States Registration Area for the year 1920 as 13.1 per thousand and stresses the hope and conviction that it is possible of further reduction, with the resultant advancing of the average age at death.

The book has serviceable appendices containing statistical data, bibliographies, addresses of private national health organizations, and a selection of books recommended for persons engaged in public health work. —*Henry B. Elkind.*